DOCUMENT RESUME

ED 061 253 TM 001 155

AUTHOR Brown, Edward K.

TITLE A Study of ESEA, Title I Impact Components on Urban Elementary Schools and Their Pupils.

INSTITUTION Philadelphia School District, Pa. Office of Research and Evaluation.

PUB DATE Apr 72

GRANT OEG-48-0043-51-011-01

NOTE 89p.; Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, Illincis, April 1972

EDRS PRICE MF-$0.65 HC-$3.29

DESCRIPTORS Arithmetic Curriculum; Basic Skills; Behavioral Objectives; Demography; *Disadvantaged Youth; *Educational Accountability; Educational Administration; Elementary Education; *Elementary School Students; Evaluation Methods; Factor Analysis; Federal Programs; Models; *Program Evaluation; Reading Ability; Resource Allocations; Student Motivation; Urban Education; *Urban Schools

IDENTIFIERS *Elementary Secondary Education Act Title I

ABSTRACT

A systematic study of the composition and dispersement of Title I projects assigned to elementary schools in Philadelphia was conducted. Categorical variables were identified from four major derived variables (program density code, school aggregate fund, pupil service component, achievement-growth differential score) and four major demographic variables (school staff, average daily attendance, per pupil and per teacher expenditures). Content analysis of the four program densities revealed (a) that four distinct implementation patterns (models) existed and (b) that the thrust of each model was programmatically different. The four implementation models were identified as (1) Educational/Cultural Enrichment Experiences; (2) General Instructional and Supervisory Support System; (3) Intensive Instructional and Supervisory Support System; and (4) Remediation Programs. Assessment of Pupil outputs provided by each model indicated that although significant differences were present between the grades, the anticipated levels of output were not achieved. However, six rational procedural alternatives for increasing the capability of the schools to increase their achievement levels within each model are provided. Findings suggest that traditional evaluation techniques are not suitable for assessing the programmatic effect of, or for developing operational management information about federal programs. (Author/AG)

ED 061253

A STUDY OF ESEA, TITLE I IMPACT COMPONENTS ON URBAN ELEMENTARY SCHOOLS AND THEIR PUPILS

Edward K. Brown

Office of Research and Evaluation

THE SCHOOL DISTRICT OF PHILADELPHIA

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

TM 001 155

Paper presented at the 1972 Annual Meeting of the American Educational Research Association, April 5, Chicago, Illinois.

A STUDY OF ESEA, TITLE I IMPACT COMPONENTS ON URBAN ELEMENTARY SCHOOLS AND THEIR PUPILS†

Although past assessment of Title I program expenditures have demonstrated their importance at local and national levels,[1] administrators are now being required to determine the total impact and cost-effectiveness of such expenditures--a process which requires more than estimates of the effects of program expenditures on a designated proportion of the pupils in the defined population. Instead, information is required which pertains to individual schools as well as the total target population of a school district. This concept of impact analysis seems to imply that expenditures should provide both <u>direct</u> and <u>indirect</u> effects. That is, systematic expenditures of monies within a fixed population should effect not only those pupils and teachers who participate directly in the program, but also others, who are experiencing like difficulties indirectly. To illustrate: The investment of projects in a school or school district should effect not only pupils in the particular grade(s) to which the projects have been assigned; it should also produce improvements in the overall achievement of that school, and the school district.

Inherent in this assumption is the belief that when pupils are exposed to initial conditions which motivate them to perform better, they will continue to exhibit their newly acquired attitudes and improved achievement patterns in subsequent school years. This assumption also appears to be substantiated (<u>a</u>) by the sampling technique used in the national assessment of Title I and (<u>b</u>) by the emphases placed on program

---

†This study was partially funded through the Office of Federal Programs (USOE Grant #48-0043-51-011-01).

concentration and comparability, and the delivery of Title I services made in the 1971 Annual Report for the President and Congress.[2] National assessment sampling techniques stress the collection of pupil data using the school as a unit of observation rather than the pupil. The 1971 Annual Report defined (a) program concentration as a practice which places the greatest proportion of funds where the greatest need exists (p. 23); (b) program comparability as the assurance that the principles of concentration and incentives result in equitable application of said funds (p. 23); and (c) the delivery of services as the dissemination of management information that would improve the delivery of such services to disadvantaged children (p. 24).

Management Decision Levels

Because of the concerns mentioned above, decisions pertaining to program funds by local education agencies (LEAs) are seldom unilateral. Three management levels are generally involved: strategic, operational, and instructional. Strategic management personnel are those who have the responsibility for making key policy decisions about the goals and directions of Title I, ESEA expenditures (e.g., members of the Board of Education, Superintendent of Schools). The policies they enunciate set the operational parameters which insure (a) the attainment of needs-assessment goals and (b) the implementation of program elements to meet the identified needs.

Operational management personnel are those in upper management levels who have the responsibility for translating the policy plans of strategic management into operational (implementation) practices. It is

they who supply the "flesh" or structures to the strategic plans and make them become a functional reality. These personnel interface with administrators and directors of essential divisions and/or departments who sustain the operations of the LEA.

Instructional management personnel are those in middle management levels who have the responsibility for defining, developing, and articulating specific programmatic inputs (in the form of instructional methods, materials, and staff development) that would facilitate the realization of the strategic plans at the classroom level. The instructional projects they design contain behavioral and/or performance objectives that seek to improve the achievement of the pupils in the target population.

The interactive relationships among these management levels, the resultant management actions corresponding to the appropriate level, and the assessment techniques used to produce requisite management information are presented in Figure 1. This figure shows (a) that at least three levels of management information are required to satisfy the needs of the LEA management personnel, and (b) that to date no system for assessing the impact of the implementation decisions of operational management exists.

Implementation of Title I Projects

In Philadelphia Title I program funds are realized as educational projects at the school level. These projects range from provisions for spealized projects (i.e., classes for mentally and emotionally disturbed children) to a wide variety of enrichment experiences (e.g., art, world

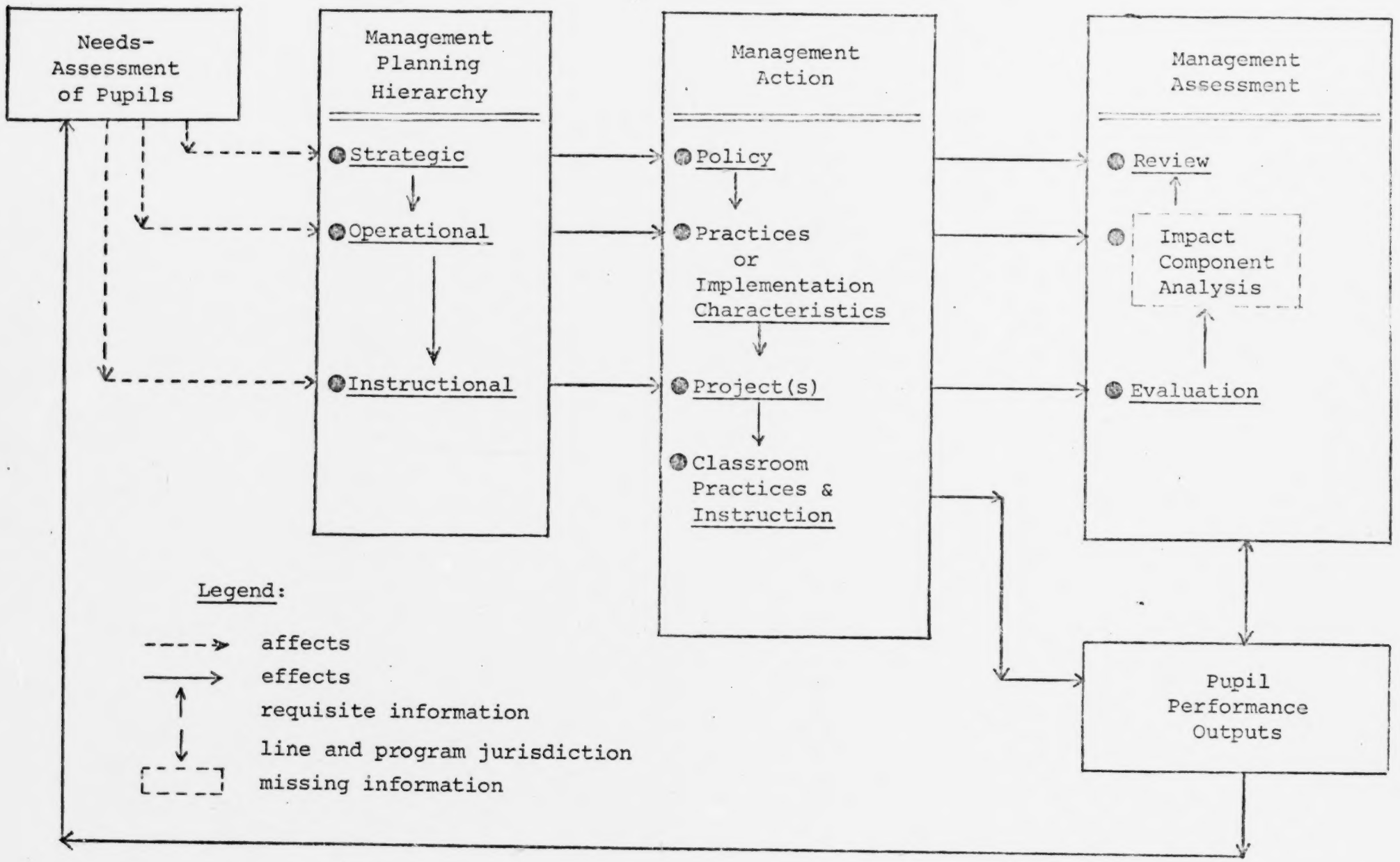


Figure 1. Interactive relationships among LEA management levels and the implementation of Title I programs.

affairs clubs). Included in this range of projects is a number of projects designed to improve the pupils' performance in reading and arithmetic. In essence, the thrusts of the school district's expenditure of Title I program funds are directed toward the implementation of instructional and supportive services for the total development of its pupils. That is, to involve its pupils in a variety of activities which lead (a) to improved academic achievement, (b) to improved self-perception, (c) to increased social involvement, and (d) to improved assessments of individual potentialities. In addition, parents and the Community are encouraged to participate in school-community programs and activities.

Although these goals might seem to be too general or non-specific to produce meaningful pupil outputs, their programmatic inputs are directed toward the maintenance and/or control of school achievement variance. In his study of individual differences, Bloom[3] identified three major variables which could account for as much as 90% of the systematic variation observed in school achievement performance: entry behavior, affective entry characteristics, quality of instruction. Table 1 shows the categorical partitions of partial and summative school variance, as defined by Bloom, and the corresponding programmatic Title I project components for the Philadelphia schools.

This table gives the analogues drawn between the three major variables for controlling pupil performance (in elementary schools) identified by Bloom and three major Title I project components. The entry behavior characteristics in Bloom's classification are equivalent to the aims, objectives, and treatment outcomes of Title I BAS project components. Both entry behaviors and BAS components, although not mutually inclusive

TABLE 1

Analogues Between Bloom's Partition of School Achievement Variance Variables and the Programmatic Input Components of Title I Projects

Bloom's Selected Variables	Probable limit of Variation in School Achievement	Title I Project Content
(1) Entry Behavior--prerequisite learnings for the attainment (mastery) of tasks, largely cognitive in nature (p. 8)	50%	Basic Skills (BAS) Development--provide requisite reading and arithmetic skills, variables strongly correlated with cognitive performance output
(2) Affective Entry Characteristics--a compound of interest and attitudes toward school and schooling, deep-seated self-concepts and personality characteristics (p. 9)	25%	Instructional, Other (IO)--provide a wide variety of affective, asthetic, cultural, and societal experiences to improve self-concept, personal and cultural awareness
(3) Quality of Instruction--effectiveness of teachers to use techniques for managing instruction and for adapting to the varying needs and requirements of the learner (p. 12)	25%	Supportive Services (SUP)--provide additional personnel and material resources to improve instructional methods, techniques, and attitudes
(1) + (2)	65%	BAS + IO
(1) + (2) + (3)	90%	BAS + IO + SUP
(1) + (3)	?	BAS + SUP
(2) + (3)	?	IO + SUP

by current definitions, are contiguous with (a) the learning readiness skills described by Ausubel[4] and Jensen,[5] and (b) the basic elements upon which the learning sets of Harlow[6] and Gagné[7] are constructed.

The equivalence between affective entry characteristics and IO project components appears to be more explicit than the previous condition in that the objectives of IO project components are to create and/or develop the characteristics described by the affective entry behaviors.

The quality of instruction variable of Bloom and Title I SUP project components appear to be tautomeric. Bloom's definition of quality of instruction describes the desired outcomes of SUP components: (a) to assist teachers in becoming more effective teachers and (b) to provide each classroom with a variety of multi-level and multi-modal materials to meet the individual needs of its pupils.

Although the explanations given above show the relationships between the two systems for affecting school achievement variance, analyses to establish the actual proportions of variance attributable to Title I project components have, as yet, not been conducted. However, if the analogies between the two universes are consistent, the proportions of explained variance derived by Bloom (probable limit of variation) represent the conditional limits or levels of impact Title I project components have on the output of the target populations.

To illustrate the extent to which such combinations for control effects could exist within a school district, suppose one had a limited number of Title I projects (n=10) and a known population of schools (n=10). From these numbers it is easy to see (a) that the universe of possible project combinations is extremely large ($\sum_{i=1}^{10} C_i$) and (b) that the probability

that any one subset of projects from this universe would appear in a given school is very small ($p=1/2^{10}$). In addition, if a specific subset of projects from this universe were to occur at a frequency that exceeded its individual probability, then that subset of projects would not be a random occurrence, but a reflective index which describes the programmatic thrusts of the school district. If that subset of projects were a prescriptive input obtained from a needs-assessment of the pupils in the target population, then it represents a systematic resource input designed to ameliorate identified needs of the pupil population. Moreover, if a number of these subsets exists within a given population of schools and pupils, then no unitary measure should be used to assess the total success of the program input (treatment) systems on pupil output. In fact, it may be this phenomenon--the cumulative effects of intrinsic pupil and/or school program input systems--which confound our efforts to measure the total impact of such federal programs.[8]

Current Evaluation Techniques

The ability of current evaluation techniques to measure or assess the pupil outcomes of these kinds of programs has been the cornerstone of much discussion.[9,10,11,12,13] If, indeed, these techniques are not sensitive enough to measure the differential or incremental changes in pupil performance produced by these kinds of programs, then it is quite possible that meaningful changes in pupil performance might have occurred in cases where no significant program effects were reported.[14]

The need to demonstrate the relationship between monies invested in education and pupil outcomes is paramount. In his discussion of

accountability, Lieberman[15] concluded that since little positive evidence is available that proves that large investments of monies in education are producing meaningful pupil outputs, the public and educators will begin to demand other alternatives for educations which may be more ineffective than the present system.

Although a wide variety of methods have been proposed for generating cost-effectiveness data, the acceptance and use of these methods by school systems have not been commensurate with their, and the public's demand for such information. Currently, two general methods are being used to produce cost-effectiveness data. One method (program-planning-budgeting system, PPBS) encourages the articulation of program or educational objectives around which planned budgets are developed (a) prior to the implementation of the prescribed programs and (b) in advance of budgetary appropriations.[16,17,18,19] The other method encourages the use of regression analysis or simultaneous equations which are used to predict cost-effectiveness or cost benefit indices.[20,21,22,23,24]

Although the two general methods mentioned are rigorous techniques for providing reliable cost information, the characteristics of the variables used in these assessment procedures, as well as the length of time that is required to establish them as key decision-making tools, preclude their generalizability and immediate implementation.[25] Green[26] and Durstine[27] have suggested that pilot or exploratory studies be undertaken which produce prompt and useful information for school management in areas of their greatest concerns. Such endeavors, they concluded, would begin to demonstrate the usefulness of cost information in the decision-making process.

One expressed area of concern by school (operational) management relates to the need for having a viable method for allocating and re-allocating personnel and material resources to produce improved pupil performance. However, because of the complex, intricate organizational and instructional structures of an educational system, grandiose, broad-sweeping reorganizational plans for personnel and material resources over short periods of time are neither practical nor productive. Instead, school (operational) management must have information that permits them to propose and implement prudent, systematic changes to meet immediate and projected school district needs.

The articulated concerns for appropriate change mechanisms and for a functional accountability system seem to imply that school (operational) management needs to have a program impact or accountability information system that produces reliable global information. That is, systematic information which demonstrates (a) the relationships between major areas of program inputs, (b) the interrelationships among their components, and (c) the independent and combined effects of these components on desired pupil outcomes.

Statement of the Problem

In Philadelphia there are 16 Title I projects which serve 63 elementary schools having a kindergarten to grade six organization. These elementary schools have project component sets of varying combinations which contain from a minimum of one project to a maximum of eight projects. To quantify these levels of program input, a program density code (PD) was developed. Operationally, this code represents the magnitude of Title I

program investment realized at the instructional management level of each elementary school. A listing of the 16 projects and the distribution of these project component sets, by level of program input, are shown in Table 2 on page 12.

The evaluations of the individual projects assigned to Title I schools over the past three years have indicated that these projects are reaching their individualized objectives. In addition to the annual evaluation reports,[28] an historical document is kept on each project.* Although the Digest serves as a thesaurus of project information, the findings of the individual project's impact cannot be readily integrated into primary resource data for answering some of the broad, programmatic questions raised by operational management personnel. For example:

Question 1. Have the placement of projects in the schools addressed themselves to the production of instructional climates which are consistent with the needs of the pupils for whom they were designed to serve?

Question 2. Have the placement of projects in the various schools created instructional or learning environments (a) which motivate the pupils to learn and (b) which facilitate the development of classroom conditions which enable the teachers to improve their teaching practices?

Question 3. Have the implementation practices permitted the apportionment of the total Title I program funds into expenditure configurations which permit the realization of the desired pupil and teacher outcomes?

As was shown in Figure 1, the project information obtained from the evaluation of individual projects provides only one piece of the total

*Digest of ESEA, Title I Projects. Philadelphia: Department of Instructional Systems Research, Office of Research and Evaluation, School District of Philadelphia, 1970.

TABLE 2

Title I, ESEA Elementary School Projects (N=16)

Afro-American Education Project (AEP)
Art Specialist Teachers (AT)
Closed Circuit Television (CCTV)
Computer-Assisted Instruction (CAI)
Counselor Aides (CA)
Creative Dramatics (CD)
Education in World Affairs (EWA)
EIP Aides (EIP)
English as a Second Language (ESL)
Improvement of Reading Skills (IRS)
Instructional Materials Center (IMC)
Kindergarten Aides and Supervisors (KA)
Learning Centers (LC)
Music Specialist Teachers (MT)
Paired-Schools Science Project (PSP)
School Community Coordinators (SCC)

Distribution of ESEA Title I Projects in Elementary Schools by Program Density

Program Density	Number of ESEA Title I Projects in a School[a]	Total
1	1 or 2	14
2	3 or 4	14
3	5 or 6	28
4	≥ 7	14
	Total	70

[a]Only elementary schools with K-6 organizations are included.

information required by operational management personnel. According to their defined responsibilities, persons at this management level make decisions concerning (1) the kinds of practices that should be implemented to achieve the policy goals of strategic management and (2) the allocation of Title I program funds, as individual projects, to respective schools within the target population. Therefore, an impact component analysis technique was developed to provide operational management with information about the feasibility and viability of their decisions. Specifically, the technique was designed:

1. To identify and describe the implementation patterns within the 63 elementary schools;

2. To ascertain whether the impact components of the emerging implementation pattern are consistent with the needs-assessment of the pupil populations they were designed to serve;

3. To produce service cost information which relates implementation inputs to anticipated and/or attained pupil and school outputs; and

4. To provide operational management with a number of alternative procedures for narrowing the discrepancy between desired pupil outputs and systematic program inputs.

To test the hypotheses (1) that a limited number of Title I project component subsets exist for the elementary schools of Philadelphia and (2) that such project component subsets are indicative of systematic resource inputs to ameliorate identified pupil needs, a study of the composition and dispersement of 16 Title I projects (see Table 2) assigned to 63 elementary schools was conducted using the impact component analysis technique.

METHOD

The derivation and development of the impact component analysis techniques follow the strategies of operations research (OR). OR procedures emphasize the use of the scientific method to discover the causes for a phenomenon rather than the application of existing techniques. OR procedures also lead (a) to the articulation of theories for explaining the observed characteristics of the operation and (b) to the production of alternative procedures, practices, or policies for the system under investigation. OR analyses, therefore, stress the reduction of complex and involved systems or problems into a series of simple components which may be described, observed, and quantified.[29]

Macleod,[30] reporting on a successful method for adapting program budgeting techniques to nonprofit institutions, also stressed the need to define the activities of the institution. He found it necessary (a) to categorize the various levels of the institution's internal and external services and (b) to ascertain how much personnel time was being allocated to the specified services before he could reasonably apply the principles of program budgeting. From these estimates, he was able to develop cost data which improved his planning and reporting activities, as well as the reallocation of the institution's services.

Block,[31] describing a new method of project control--Accomplishment/Cost Procedure (ACP), appeared to have taken an OR approach similar to that advocated by the author. In constructing his method, he chose four comprehensive areas as being indicative of the functions of the organizations studied: (1) unique events, activities in which major work tasks are independent; (2) repetitive events, activities with similar work tasks;

(3) material, acquisition of materials used in the finished products; and (4) summary, a process of integrating the preceding areas into a simple category (p. 114). These procedures permitted him to compare cost/progress relationship budgeted with cost/progress relationship expended for the tasks, thereby producing useful project control information for all levels of project management (p. 111).

Systematic Input/Output Variables Associated with Title I Elementary Schools

Pupil Service Components (PSCs)

To characterize the programmatic resource inputs provided by the Title I projects, three pupil service component (PSC) categories have been identified: (1) basic skills, BAS, (2) instructional, other (than BAS), IO, and (3) supportive services, SUP. The relationship between these PSCs (the treatment effects) and the contribution they provide toward the reduction of school and pupil performance variance has been discussed previously in Table 1.

Allocation of Funds

To partition and prorate to each Title I school that proportion of the total program fund which it receives in the form of projects, an adaptation of the Belmont System (OE Form 4484, CPIR, 1970) was used.[32] In this technique, the total budget allocated for each project was divided by the number of schools it served. This cost/school index was obtained for each project listed in the Federal Program Budget, FY 1969-1970.* Since each school's projects were enumerated, aggregate monies per school

*1969-1970 Applications, Title I ESEA. Philadelphia: Office of Federal Programs, School District of Philadelphia.

were obtained by totaling those project fund proportionalities located in each school. The sum of monies available to the schools through this proration procedure was operationally defined as its school aggregate fund (SAF). The mean SAFs for the schools in each program density classification are presented in Table 3.

TABLE 3

Mean School Expenditure by Program Density

Proration	Program Density 1	2	3	4	Total
Aggregate Fund[a]	$6.2	$25.9	$38.6	$50.2	$39.9
Number of Schools	10	11	26	15	63

[a]Figures given in thousands of dollars.

Achievement-Growth Differential (AGD)

For this study, grades 3 through 6 were chosen as the target years--that interval of schooling over which most inner-city pupils begin to fall dramatically behind national expectations.[33] To describe and quantify the effects of a school's instructional program on its pupils and to measure the impact of the school on its pupil's educational progress over this interval, each school was assumed to have been organized around administrative and instructional practices which tended to sustain its functional capacity. In operations research terms, the assumption means that pupils are homogeneous with respect to the impact of a school's instructional program, i.e., pupils at each level are exposed to the "fixed-conditions" of the school. Consequently, as pupils move through levels within a school, the instructional or educational experiences in

which the pupils participate are (a) pre-defined, (b) constant in content, (c) perennial in preparation and presentation, and (d) managed through processes and/or procedures articulated by the administrator and teachers of that school. One expects, then, that if the instructional programs provided by a school were effective, its pupils, on the average, would gain three years of academic knowledge between grades 3 to 6 or that standardized measures of achievement would show an acquired knowledge differential of 3.0 GEY.

To obtain an estimate of the achievement-growth patterns across grades 3 to 6 in each school, differences between the mean grade scores in each school were obtained using the following formula:

$\bar{X}$ school$_1$, grade 6 - $\bar{X}$ school$_1$, grade 3 = achievement-growth

Therefore, zero, positive, or negative values could be evidenced, which would represent the impact of a school's learning environment on its pupils over grades 3 through 6.

Considering the highest and lowest possible score a pupil could receive on a standard test at grades 3 and 6, the range of possible achievement-growth scores was obtained, which defines a continuum upon which derived scores may be compared. The term, achievement-growth differential (AGD) score, therefore, describes the achievement propensity of an elementary school. In this study AGDs have values within the interval $-2.9 \leq AGD \leq +8.1$.*

*In cognizance of the issue of the comparability of the two groups and in recognition of the scalar differences between the distributions of the samples, ADG is operationally defined as a mean estimate of differential achievement growth--that is, the extent to which the educational organization and instruction of a school moved its population of pupils along a hypothetical achievement-growth curve predicted by the continuum of the psychological constructs of the test instrument.

Average Daily Attendance (ADA)

This measure of pupil attendance was chosen over total enrollment because it is a count of the number of children (a) who attend school on a regular basis and (b) who are exposed to the school's educative activities on a continuous basis.

Per Pupil and Per Teacher Expenditures (PPE and PTE)

These two cost expenditures were not obtained in the traditional manner--dividing the total Title I program fund monies by the number of children in the program. They were obtained on a school-by-school basis, using each school's SAF, ADA, and total teacher staff counts:

(a) PPE = SAF/ADA; (b) PTE = SAF/number of Teachers

This method was used to ascertain whether systematic differences in these expenditures existed across the elementary schools.

The procedure described above considers the school as the unit of observation and analysis. It also assumes that any program fund placed in a school effects the entire staff and pupil population of that school, because of the changes in school management and instructional practices that occur as a result of the investment. However, within each school there exists a differential program-input gradient which results in conditions (a) where the greatest concentration of program funds (projects) exists at those grades where the greatest pupil need are located and (b) where the residual and/or spin-off effects of the program inputs provide increasing benefits for the remainder of the school's staff and pupils.

Per Pupil Instructional Service Expenditure (PPIS)

A term used to indicate the basal amount each pupil receives

from the general operating budget for instructional services.[34] However, this figure does not include supportive materials and personnel costs.

Summative Per Pupil Expenditure (SPPE)

A term used to indicate the total per pupil expenditures provided for general instructional services and Title I program funds inputs: SPPE = PPIS + PPE (Title I). A listing of the variables previously described appears in Table 4.

Analysis

The first level of analysis was performed in this study (a) to determine the reliability of the impact component analysis model, (b) to obtain a demographic picture of the project implementation characteristics, and (c) to determine whether particular program input subsets existed within the elementary schools. The second level of analysis, contingent upon the identification of particular input program subsets, was used to identify, explain, and document the implementation model(s) or strategies developed through the decisions and directions of the operational management.

Level 1. To obtain a composite picture of the 63 Title I elementary schools along the dimensions of the variables used in the study, basic techniques were used to obtain the mean, median, and range of each variables. As a measure of the construct validity of the proposed impact component technique, an intercorrelation matrix was obtained and studied to determine whether the interrelationships among the defined variables corresponded to the known relationships between the financial, demographic, and population descriptors of the school district. To ascertain whether

TABLE 4

A Listing of the Dependent and Independent Variables Used in the Study

Variable Number	Description	Acronym
1	School Enrollment	SE
2	Average Daily Attendance	ADA
	Pupil Population Characteristics	PPC
3	Low Income	PPC-1
4	Spanish-Speaking	PPC-2
5	Blacks	PPC-3
6	Teacher Staff	TS
	Achievement Growth Differential	AGD
7	Reading	AGD-R
8	Arithmetic	AGD-A
9	Program Density Code	PDC
	Pupil Service Components	PSC
10	Basic Skills	PSC-1
11	Instructional, Other	PSC-2
12	Supportive Services	PSC-3
	School Aggregate Fund	SAF
13	Basic Skills	SAF-1
14	Instructional, Other	SAF-2
15	Supportive Services	SAF-3
16	Total	SAF-4
17	Per Pupil Expenditure	PPE
18	Per Teacher Expenditure	PTE
19	Per Pupil Instructional Service	PPIS
20	Summative Per Pupil Expenditure	SPPE
	School Achievement Gain	SAG
21	1968-1969: Reading AGD	SAG-1
22	Arithmetic AGD	SAG-2
23	1969-1970: Reading AGD	SAG-3
24	Arithmetic AGD	SAG-4

unique project input subsets existed within the 24 variables used to define the programmatic implementation patterns created by the decisions of the operational management personnel, a factor analysis procedure (BMD 03R) was used, where the highest correlation value of each variable was used as its commonality.

Level 2. Having identified the least number of program input subsets, a content analysis procedure was used to ascertain the programmatic thrust of each subset. This procedure consisted of the merging of the individual content (i.e., objectives, treatment(s), materials, strategies) of each project within a subset into a comprehensive or summative descriptor. Accordingly, demographic and statistical data were developed for each subset. To determine whether significant differences existed between the subsets on each variable, a series of one-way analysis of variance were performed.

To ascertain whether the programmatic inputs of each subset produced a differential, aggregate and/or individual grade effect on pupil performance in reading and arithmetic, a 20% systematic sample* of pupils, within the Title I elementary schools of the subsets and within non-Title I schools, was obtained for analysis. One-way analysis of variances were performed on the aggregate and individual grade data to determine whether significant differences in performances scores existed.

Program input/pupil output schemata were developed for each subset to determine whether the programmatic inputs for each grade, as well as for the three-year-period studied, differed significantly from subset to subset. An assessment of the relationship between the program-

*Pupil History File, Division of Administrative and Survey Research, Office of Research and Evaluation, School District of Philadelphia.

matic inputs and the needs-assessment of the pupils within the individual subsets was performed. The purpose of this analysis was to ascertain whether the proportion of pupils achieving the desired level of performance (output) were consistent with the configuration of PSC funds made available to the schools. A similar technique was used to determine whether the PSC configurations of the subsets were parallel to the school achievement control patterns described by Bloom.

RESULTS AND INTERPRETATIONS

Level 1

Demographic and Statistical Data

The median school in the sample of schools used in the study had the following characteristics:

Composite Profile of the Median Title I Elementary School

School Enrollment		750
Average Daily Attendance		700
No. Black	625	
No. Spanish Surname	18	
No. White	107	
Low Income (185)	24.7%	
Teacher Staff		26
School Aggregate Fund		$33,800[a]
Basic Skills	$18,000	
Instructional Other	9,800	
Supportive Services	15,800	
Per Capita Expenditures		
Teacher		$1,000
Pupil, Title I		30
Pupil, Instructional Services		450
Pupil, Summative[b]		495
Pupil Service Component (5 Projects)		
1 Basic Skills Project		
2 Instructional Other Projects		
2 Supportive Service Projects		
Achievement-Growth Differential Scores		
Reading = 1.9 GE years in 3.0 school years		
Arithmetic = 2.0 GE years in 3.0 school years		

[a]Sum of categories is greater than aggregate, since each subcategory was treated as an independent variable.

[b]Includes only general operating and Title I funds.

A more detailed treatment of each variable appears in Table 5. (pp. 25-26).

Construct Validity Data

One of the most important responsibilities of a proposed model is to demonstrate that the key indicators and program descriptors used to define it can be used to describe, with a high degree of accuracy, the actual conditions of the system for which it has been designed to represent. In this study, all of the key indicators and program descriptors were analyzed by a correlation procedure to ascertain whether the resultant correlation values among the 24 variables represented observed (known) relationships that exist within the School District--especially in its allocations for instructional staff, Title I program funds, and pupil achievement.

Three subsets from the intercorrelation matrix of the 24 variables (see Appendix A) are presented to illustrate the interrelationships identified among the key variables themselves and within the contextual framework of the proposed model.

Major and minor variables. Since school enrollment (SE) is one variable used in the appropriation of instructional staff, program funds and materials, a listing of its correlation with eight other minor variables is presented below.

Major Variable	Minor Variable							
	ADA	TS	SAF-4	PPC-1	PPIS	SPPE	PPE	PTE
SE	87*	88*	27**	68*	-61*	-65*	-46*	-41*

*p < .01
**p < .05

This listing shows (a) that all correlation pairs, with the exception of

TABLE 5

Demographic and Statistical Characteristics of 63 Title I Elementary Schools

Variable	No. Schools Having Variable	Median	Range
School Aggregate Fund			
Total	63	33.8[a]	9.4 - 85.1[a]
BAS	33	18.0	9.8 - 59.3
IO	58	9.8	1.2 - 20.4
SUP	56	15.8	5.8 - 22.0
School Population Characteristics			
School Enrollment	63	750	188 - 1,546
Average Daily Attendance	63	700	155 - 1,435
No. Teachers	63	26	8 - 47
No. Low Income	63	185	27 - 1,043
No. Spanish Speaking	46	18	1 - 590
No. Black	63	625	2 - 1,546
Per Capita Expenditures			
Pupil	63	$ 30	$ 10 - 252
Teacher	63	1,000	400 - 4,880
Instructional Services[b]	63	450	357 - 660
Summative[c]	63	495	386 - 794

[a]In thousand of dollars.
[b]Allocation from general operating budget.
[c]General operating budget and Title I funds.

TABLE 5 (CONT.)

Demographic and Statistical Characteristics of 63
Title I Elementary Schools

Pupil Service Components						
No. Projects	BAS		IO		SUP	
	No. Schools Having	% of Sample	No. Schools Having	% of Sample	No. Schools Having	% of Sample
0	29	46	1	2	6	10
1	31	49	12	19	14	22
2	2	3	14	22	39	62
3	1	2	22	35	4	6
4			11	17		
5			3	5		
6						
Total	63	100	63	100	63	100

Achievement-Growth Differential		
	Reading	Arithmetic
School year 1969-1970[a]	1.90 GEY[b]	1.98 GEY
range	0.1 - 3.1	1.3 - 3.2

[a]Median difference between mean scores of grade six and grade three pupils.

[b]GEY = grade equivalent years.

total school aggregate fund (SAF-4), were highly significant ($p < .01$) and (b) that the relationships of SE with per capita expenditures were all negative.

As expected, the two highest correlations with SE were average daily attendance (ADA, $r = .87$) and teacher staff (TS, $r = .88$), followed by its relationship with children from low income families (PPC-1, $r = .68$). The negative relationships of SE with per capita expenditures were not anticipated and might have resulted as a phenomenon of standardized allocation procedures.

Allocation predictors. Eleven variables, which generally appear in allocation prediction formulae, were extracted from the primary intercorrelation matrix. These variables, and their accompanying correlation pairs, appear in Table 6. Of the 55 correlation pairs, 22 were significant ($p < .01$). The highest two were between the per capita expenditures: per teacher (PTE) with per pupil, Title I (PPE) and Instructional Services (PPIS).

TABLE 6

Intercorrelation Matrix of Common Allocation Predictors

Variable	1	2	3	4	5	6	7	8	9	10	11
1. AGD-R	-										
2. AGD-A	77*	-									
3. SE	14	-04	-								
4. ADA	16	-05	87*	-							
5. PPIS	-06	04	-61	-58*	-						
6. PPE	-36*	-01	-46*	-51*	38*	-					
7. SAG-1	09	00	-06	-12	19	06	-				
8. SAG-2	-06	03	-14	-19	25	33*	57*	-			
9. SAG-3	49*	46*	10	10	13	-12	31*	14	-		
10. SAG-4	40*	50*	16	-15	23	18	32*	40*	52*	-	
11 PTE	-42*	-09	-41*	-45*	91*	96*	00	24	-15	10	-

*$p < .01$

Expected significant positive correlations were those between (a) AGD-R and AGD-A, (b) ADA and SE, (c) PPE and PPIS, (d) SAG-2 and PPE, (e) between all SAGs, (f) between all AGDs, and (g) between all SAGs and AGDs.

A significant negative correlation was expected between AGDs and PPE, since specific plans were made to place the larger proportions of Title I funds in those schools having the lowest levels of achievement. (The other two significant negative correlations with PPE were reported in the previous section.) Of the three other significant negative correlations with PTE, the one between it and achievement-growth differential in reading (AGD-R) was not anticipated.

It should be noted that the relationship between per capita expenditures for instructional services from the general operating budget (PPIS) and school achievement gains in arithmetic, 1968-1969 and 1969-1970 (SAG-2, SAG-4), as well as PTE and SAG-4, were significant to a lesser degree ($p < .05$).

Program Density Code. The correlations between one of the key variables of the proposed model, Program Density Code (PDC), and 14 other systematic variables are presented in Table 7. Of the 14 variables identified below, eight were significant ($p < .01$)

TABLE 7

Interrelationships Between the Construct "Program Density Code" and 14 Systematic Variables

Major Variable	Minor Variable													
	SE	ADA	TS	PPC-1	SAF-4	PPE	PTE	PPIS	SPPE	AGD-R	AGD-A	PSC-1	PSC-2	PSC-3
Program Density Code (PDC)	23	15	24	46*	78*	47*	56*	-13	12	-37*	-21	66*	82*	74*

*$p < .01$

As hypothesized, PDC's interrelationships with the other variables provided evidence that the construct was defining the programmatic inputs of Title I program funds at the elementary school level. First, the significant positive correlation of PDC with the within-pupil service components (PSCs) and their implementation procedures, and its high correlation with the total funds available to the schools (SAF-4), seemed to substantiate the validity of the construct. Second, PDC appeared to be a construct which demonstrated the equivalency between Title I program expenditures as an aggregate fund and Title I as a iteration of per capita denotations (viz., PPE and PTE). Moreover, the construct provided confirmatory evidence that per pupil expenditures from the two major budget sources (e.g., PPIS and SAF-4) were the product of two independent allocation functions. The small negative value ($r = -.13$) between PDC and PPIS was considered to be the residual commonality (background effect) inherent in the relationships among the source variables.

Third, the negative correlation values of PDC with the AGDs was to be expected in that the greater concentration of pupil service components (projects) exists in schools where the level of pupil achievement was at its lowest. Fourth, although a significant relationship exists between PDC and children of low income families (PPC-1), two other demographic variables (school enrollment, SE and teacher staff, TS) were also related to a lesser degree ($p < .05$).

Factor Analysis Data

To ascertain whether the intercorrelation patterns discussed in

the previous sections were indicative of some unique factors operating within the context of the variables used to describe the input/output characteristics of the Title I program funding policies and practices for elementary schools in Philadelphia, a factor analysis was performed using the correlation data of the 24 variables. A standardized program (BMD 03R) was used, where the highest correlation values among the variables were used as the commonalities. Using the Kaiser criterion for the identifying meaningful factor roots (viz., vectors having eigenvalues $\geq$ +1.0), six factors were identified and rotated orthogonally. The results of the rotation procedures produced six definable factors, where variables having loadings of $\geq$ .30000 were considered to be relevant contributors to the factors. The six factors are shown in Table 8 on page 31.

Anticipated factors. At the outset, three factors were anticipated. These factors were related to three pre-existent, well-defined procedures and/or conditions: 1) a factor consisting of variables associated with the criterion predictors of general allocation formulae; 2) a factor of the achievement measures; and 3) a factor demonstrating the correspondence between the PSCs and their independent and summative costs (SAF categories). These factors did appear and were named accordingly: Factor I, Prediction Formula Criterion; Factor III, School Achievement Measurement; Factor IV, Direct Pupil Service Components. (See Table 8)

Unique factors. One major and two minor unique factors were also identified. The unique major factor, Factor II: Program Density Expenditure Functions, was identified as that factor which included all of the key variables and descriptors utilized in the formulation of the

TABLE 8

Significant Data Factors

FACTOR I: Prediction Formula Criterion		FACTOR II: Program Density Expenditure Functions	
Variable	Loading	Variable	Loading
1. SE	92667	10. PSC-1	94842
6. TS	90662	16. SAF-2	88885
2. ADA	88289	9. PDC	64523
20. SPPE	-78177	18. PTE	63424
5. PPC-3	77968	12. PSC-3	60106
19. PPIS	-66057	17. PPE	58414
18. PPE	-65897	15. SAF-3	56103
18. PTE	-60941	13. SAF-1	50387
3. PPC-1	59884	3. PPC-1	47197
13. SAF-1	33814	5. PPC-3	34829
		7. AGD-R	-30431
		11. PSC-2	30333
FACTOR III: School Achievement Measurement		**FACTOR V: General Disadvantaged Service Expenditure**	
8. AGD-A	88016	4. PPC-2	-62802
7. AGD-R	82422	19. PPIS	39830
24. SAG-4	59302	13. SAF-1	38123
23. SAG-3	58763	5. PPC-3	30105
FACTOR IV: Direct Pupil Service Components		**FACTOR VI: School Investment Outputs**	
11. PSC-2	77363	21. SAG-1	71596
14. SAF-2	74461	22. SAG-2	69780
9. PDC	63928	19. PPIS	39551
13. SAF-1	-40532	24. SAG-4	36481
12. PSC-3	39948	20. SPPE	34252
18. PTE	34509	23. SAG-3	31332
17. PPE	31394		
16. SAF-4	30898		

model. A review of the variables which load significantly on this factor (see Table 8), indicated that this factor (a) circumscribed most of the qualitative and quantitative elements of Title I program expenditures as they impact at the school level and (b) contained the seriation of components--both as monies and pupil services--which represent systematic inputs for controlling specific performance-enabling components which effect the achievement outcomes of elementary schools.

The dynamics of the proposed method for analyzing and quantifying the effects of Title I expenditures on elementary schools was revealed when the interactive relationships between Factors II and IV were demonstrated. Figure 4 shows the Cartesian plot of these coordinate pairs. The numbers beside the coordinates identify the respective variables. The configuration of points formed by the coordinate pairs seemed to suggest that the two factors may be described by two mathematical functions.

The linear function contained all of the demographic, traditional allocation predictor, per capita, and achievement variables. The parabolic function suggested the presence of an allocation condition which is predicated upon the PDC construct (#9) and its accompanying method for partitioning pupil service components (#10 and #11) and school funding levels (#13, #14, and #16). The two supportive service variables of this classification (#12 and #15) scheme were noticeably absent. Previous data, however, had shown that supportive services did not relate highly with any particular variable but acted like a multi-functional element that fitted more precisely with those personnel or service areas for which it had been programmatically associated (see Appendix A).

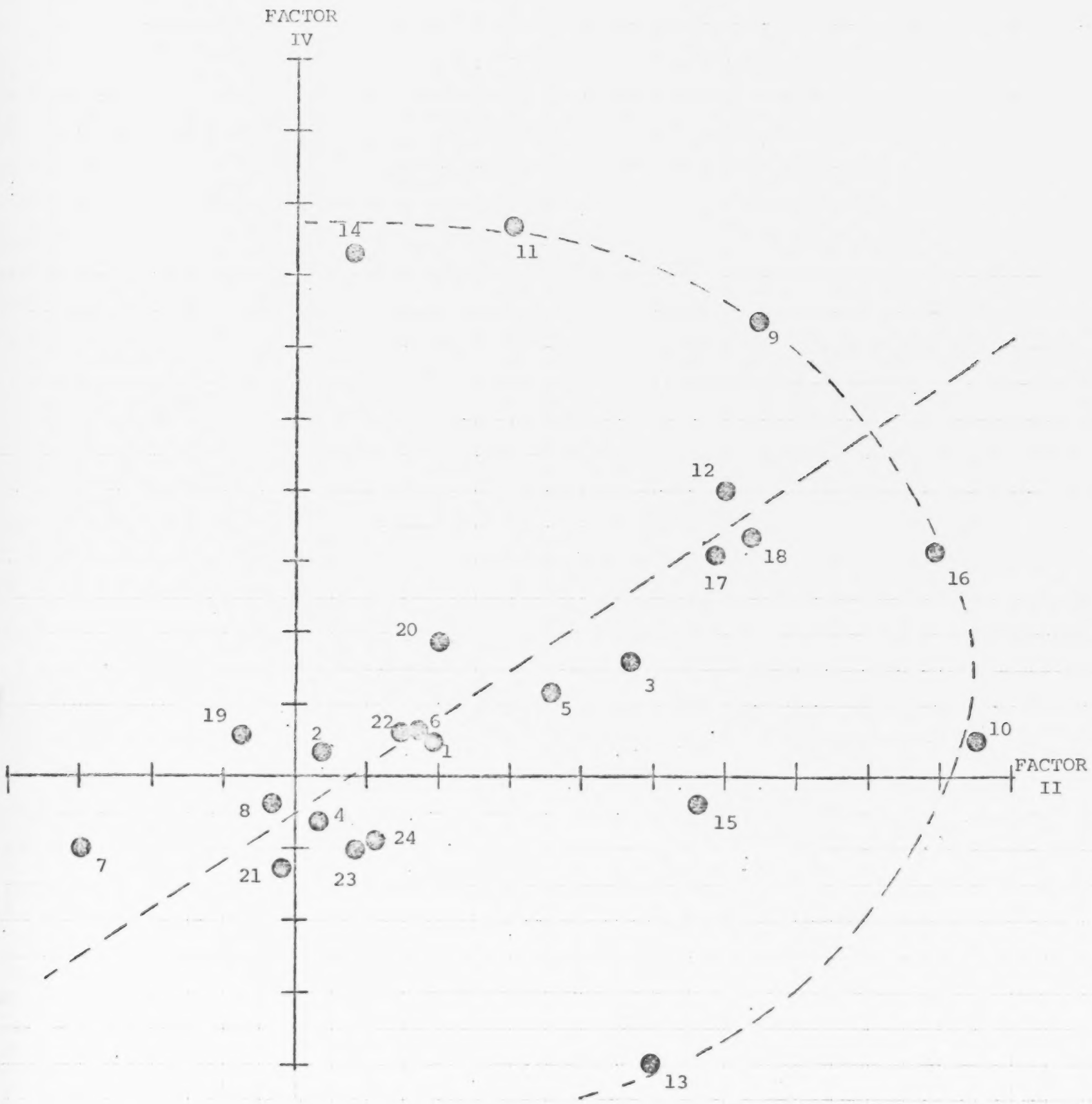


Figure 4. Cartesian plot of Factor IV and Factor II.

It should be noted that the two equations are not independent. There appears to be at least one solution (functional relationship) for the equations, as evidenced by the projected point of intersection ($x = .81$, $y = .48$).

The other two minor factors were related (a) to a conglomerate expenditure of funds for the improvement of instructional services for pupils generally classified as being disadvantaged or from low socio-economic environments and (b) to a conglomerate expenditure of funds related to the measurement of changes in total school performance in reading and arithmetic.

Factor V, General Disadvantaged Service Expenditure, was an expenditure function which related total monies [appropriated from Title I program funds (SAF-1) and the general operating budget (PPIS)] earmarked for the improvement of Black (PPC-3) and Spanish surnamed (PPC-2) pupils' performance in basic skills. The contribution of PPIS to this service was better understood when its relationship with per capita expenditures for pupils ($r = .38$) and teachers ($r = .91$) was considered.

Factor VI, School Investment Outputs, was an expenditure function which demonstrated the impact of the general operating budget (PPIS) and summative per pupil expenditure inputs (SPPE) on the school's endeavors to improve its propensity to provide continuous pupil growth (SAF-1, 2, 3, and 4).

Level 2

Of the six factors identified by the factor analysis procedure, Factor II, Program Density Expenditure Functions, appeared to represent a reliable construct for describing, defining, and illustrating the functional components and interrelationships existing between the implementation inputs (program policies and practices) of operational management personnel and the subsequential achievement outputs of elementary pupils and schools served by Title I funds.

Characteristics of the Program Density Levels

Since four program density levels were inherent in Factor II, four inclusive project-within-density content analyses were performed to determine (a) what kinds of pupil service component projects were available to the schools in each density level, (b) which pupil service component projects occurred most frequently within and across the density levels, and (c) whether the patterns of pupil service component projects within density levels were related to the observed pupil performance patterns. To accomplish this objective, a project implementation matrix was constructed in which all of the projects available to the elementary schools were listed--as is shown in Table 9* (p. 36).

Three summary lines of information are provided for each density level. The first line gives the number of schools being served by the respective projects. For example, in Density #1 there are 13 schools.

*Schools containing Learning Centers (LC) and Kindergarten Aides (KA) were not included in previous counts. Therefore, the total shown is greater than the previous listings. However, the aforementioned projects are included here in order to obtain a more reliable estimate of the program input characteristics of the density levels.

TABLE 9

Implementation Characteristics and Rankings of Programmatic Service Components Within the Four Title I Program Density Codes and the Aggregate of Schools

	Implementation Characteristics	Programmatic Service Components																Number of Schools in Model
		Basic Skills					Instructional Other							Supportive				
		CAI	EIP	ESL	IRS	LC	AEP	AT	CD	EWA	IMC	MT	PSP	CA	CCTV	KA	SCC	
Density I	No. of Schools					1	3	2		3	1	1				1	2	13
	% Involvement					8	23	15		23	8	8				8	15	
	Implementation rank[a]: AEP = EWA > AT = SCC > IMC = KA = LC = MT																	
Density II	No. of Schools	3					3	10	1		5	2	1	1		10	13	14
	% Involvement	21					21	71	7		36	14	7	7		71	93	
	Implementation rank: SCC > AT = KA > IMC > AEP = EIP > MT > CA = CD = PSP																	
Density III	No. of Schools	16	1	2	1		11	23	14	2	21	4				23	28	28
	% Involvement	57	4	7	4		39	82	50	7	75	14				82	100	
	Implementation rank: SCC > AT = KA > IMC > EIP > CD > AEP > MT > EWA = IRS > ESL = LC																	
Density IV	No. of Schools	10		4	2		13	15	10	3	11	5		2	4	14	15	15
	% Involvement	67		27	13		87	100	67	20	73	33		13	27	93	100	
	Implementation rank: SCC = AT > KA > AEP > SMC > CD = EIP > MT > CCTV = IRS > EWA > CA = LC																	
Totals 70	No. of Schools	29	1	6	4		30	50	25	8	38	12	1	3	4	48	58	70
	% Involvement	42	1	9	6		43	73	36	11	54	17	1	4	6	69	83	
	Implementation rank: SCC > AT > KA > IMC > AEP > EIP > CD > MT > EWA > IRS > CCTV = LC > CA > ESL = PSP																	

[a]Rank order is determined by the magnitude of school involvement where the highest percentage of involvement is given a rank of 1.

Under the pupil service component category "Instructional Other (IO)," one observes that three schools have AEP, two have AT, three have EWA, one has IMC, and one has MT. (See Table 2 for an explanation of the acronyms.)

The second line of information gives the extent to which the specified projects occur within the schools of the density level. Using the example above, one finds that the percentage of occurrence of the projects in the IO category is 23, 15, 23, 8, and 8 respectfully.

Since the pupil service component projects establish the instructional and programmatic characteristics of each density level, the frequency or proportion of times they occur within a density level reflects the nature or implementation characteristic (programmatic input) of the density level. To summarize and explicate those projects which were most indicative of the implementation characteristics of a given density, another level of information was developed--implementation ranks, shown as the third line of each density level. This ranking procedure entailed the listing of the implementation magnitude of pupil service component projects (PSCP) within each density level. In Density #1 the ranking was: AEP=EWA>AT=SCC>IMC=KA=LC=MT, which meant (a) that AEP and EWA occurred the same number of times in the schools of the density level and (b) that both projects occurred more frequently than those which follow them. Collectively, since the first three positions in the implementation rank order have goals or objectives which were directed toward the attainment of cultural and social enrichment, it was concluded that the thrust of this density level provides for the improvement of a pupil's awareness of his and other's social cultures, and an appreciation for the aesthetic qualities of life. Therefore, this

Density level was named: Educational/Cultural Enrichment Experiences.

In Density #2, the implementation information revealed that most schools in this Density level had SCC (93%), KA (71%), and AT (71%). Other PSCP occurring at meaningful levels were IMC (36%), AEP (21%), and EIP (21%). Collectively, the implementation rank order suggested that the thrust of this Density level stressed the use of the community (SCC), additional instructional programs (AT, IMC, MT), and supportive personnel (KA, EIP) as its major thrusts for the improvement of pupil performance. Therefore, this Density level was named: General Instructional and Supervisory Support System.

In Density #3, the implementation information revealed that most schools in this Density level had SCC (100%), KA (82%), AT (82%), and IMC (75%). Other PSCP occurring at meaningful levels were EIP (57%), CD (50%), and AEP (39%). The emphasis of this Density level was somewhat similar to that of the previous model. However, with the increased number of BAS projects and the larger proportion of schools having IO and SUP projects, this Density level seemed to provide a more intensive concentration on the development of basic skills and human qualities. Collectively, the implementation rank order suggested that this Density level be named: Intensive Instructional and Supervisory Support System.

In Density #4, the implementation information revealed that most schools in this Density level had SCC (100%), KA (93%), AEP (87%) and IMC (73%). Other PSCP occurring at meaningful levels were CD (67%) and EIP (67%). In contrast to the other density levels, this Density level had a significantly greater number of schools having BAS projects--in particular EIP Aides. Collectively, the implementation rank order

implied that this Density level, having a greater number of projects and additional instructional aides in their classroom, emphasized (a) greater project involvement and (b) the individualization of instruction. Therefore, this Density level was named: Remediation Program.

When the implementation rank order pattern over the total population of schools was reviewed, it appeared that as of June 1970, the greater proportion of Title I program funds was invested as supportive and instructional services. Investments for the improvement of basic skills appeared in two forms: direct projects as EIP (42%), IRS (9%), and LC (6%); indirect projects as IMC (54%), CD (36%), and KA (69%).

Program Expenditure, Pupil and School Characteristics of the Four Implementation Models

Implementation Model I: Educational/Cultural Enrichment Experiences

This level of program expenditure was directed toward the improvement of a pupil's awareness of his own and other social cultures, and an appreciation for the aesthetic qualities of life.

In Model I there are 11 elementary schools. The average school enrollment is 732 pupils, 667 (91.1%) of whom attend on a daily basis. The school's population generally consists of 49.8% Black, 1.0% Spanish surname, 49.2% White, and 20.4% Low Income pupils. There are, on the average, 24 teacher staff positions per school. The average amount of Title I funds allocated to each school is $6,200 ($2,540 as IO projects, $3,660 as SUP). This SAF total represents an average per pupil expenditure of $12.00 and per teacher expenditure of $78.00. The school provides, on the average, a growth of 2.4 GE years in reading and 2.3 GE years in

arithmetic skills over 3 school years of instruction.

Implementation Model II: General Instructional and Supervisory Support System

This level of program expenditure was directed toward the improvement of instructional programs at all elementary grades. The thrusts of the model are directed toward the use of the community, supervisory personnel, and additional instructional programs.

In Model II there are 11 schools. The average school enrollment is 829 pupils, 736 (88.8%) of whom attend on a daily basis. The school's population generally consists of 86.7% Black, 1.2% Spanish surname, 12.1% White, and 25.7% Low Income pupils. There are, on the average 27 teacher staff positions per school. The average amount of Title I funds allocated to each school is $25,900 ($3,500 as BAS*, $8,200 as IO, $14,200 as SUP). This SAF total represents an average per pupil expenditure of $44.00 and per teacher expenditure of $1,097. The schools provide, on the average, a growth of 1.9 GE years in reading and 2.0 GE years in arithmetic skills over 3 school years of instruction.

Implementation Model III: Intensive Instructional and Supervisory Support System

This level of program expenditure was directed toward the improvement of instructional practices and supervision--particularly in the area of basic skills. The thrusts of the model take the form of instructional aides and supervisors.

---

*Value obtained by dividing categorical funds by total number of schools in Models.

In Model III there are 26 schools. The average school enrollment is 827 pupils, 736 (89.0%) of whom attend on a daily basis. The school's population generally consists of 79.8% Black, 8.6% Spanish surname, 11.6% White, 35.3% Low Income Pupils. There are, on the average, 27 teacher staff positions per school. The average amount of Title I funds allocated to each school is $38,600 ($13,900 as BAS*, $9,600 as IO, $15,100 as SUP). This SAF total represents an average pupil expenditure of $66.00 and per teacher expenditure of $1,648. The schools provide, on the average, a growth of 1.8 GE years in reading and 1.9 GE years in arithmetic skills over 3 school years of instruction.

Implementation Model IV: Remediation Programs

This level of program expenditure was directed toward the establishment of permanent basic skill centers and systems which provide the pupils with a continuous exposure to (a) individualized instructions, (b) a concentration of new and innovative materials, and (c) an increased involvement of school and community support systems.

In Model IV there are 15 schools. The average school enrollment is 979 pupils, 825 (84.3%) of whom attend on a daily basis. The school's population generally consists of 85.4% Black, 0.7% Spanish surname, and 13.8% White, and 47.4% Low Income pupils. There are, on the average, 31 teacher staff positions per school. The average amount of Title I funds allocated to each school is $50,200 ($20,600 as BAS*, $12,500 as IO, $17,100 as SUP). This SAF total represents an average per pupil expenditure of $67.00 and per teacher expenditure of $1,720. The schools provide,

*Value obtained by dividing categorical funds by total number of schools in Models.

on the average, a growth of 1.8 GE years in reading, and 2.0 GE years in arithmetic skills over 3 school years of instruction.

A summary of the statistical data across the quantitative variables by Implementation Model is given in Table 10. This table shows that significant differences between the models exist on the following variables: PPC-1, PPC-3, AGD-R, (SAF-1), SAF-2, SAF-3, SAF-4, PPE, and PTE.

TABLE 10

Summary of Variable Data by Implementation Model

	Variable	Implementation Model I (n=11)	II (n=11)	III (n=26)	IV (n=15)	Combined (N=63)	F Ratio[a]
1.	SE	732	829	827	979	847	1.37 n.s.
2.	ADA	667	736	736	825	745	0.55 n.s.
3.	PPC-1	149	213	292	464	294	5.87*
4.	PPC-2	7	10	71	7	32	1.62 n.s.
5.	PPC-3	365	719	660	837	670	3.43**
6.	TS	24	27	27	31	28	1.28 n.s.
7.	AGD-R	2.4[b]	1.9	1.8	1.8	1.9	4.94*
8.	AGD-A	2.3[b]	2.0	1.9	2.0	2.0	2.67 n.s
13.	SAF-1	0.0[d]	(19.2)[c]	(20.2)	(23.8)	(21.54)	0.43 n.s.
14.	SAF-2	2.54	8.20	9.60	12.50	9.40	7.26*
15.	SAF-3	3.66	14.20	15.10	17.10	15.20	6.56*
16.	SAF-4	6.20	25.90	38.60	50.20	33.90	34.88*
17.	PPE	12.00[e]	44.00	66.00	67.00	53.00	6.82*
18.	PTE	0.28[d]	1.10	1.65	1.72	1.33	11.20*
19.	PPIS	494.00[e]	452.00	476.00	456.00	470.00	1.05 n.s.
20.	SPPE	506.00[e]	496.00	541.00	522.00	523.00	0.80 n.s.

[a]One-way analysis of variance for unequal n's.
[b]Grade equivalent years of growth in three school years.
[c]Values represent a relatively small number of schools in samples: M-II=2, M-III=18, M-IV=13.
[d]In thousands of dollars.
[e]In dollars.
*p < .01
**p < .05

Three significant facts concerning the programmatic input of Title I funds to meet the needs of elementary school pupils in Philadelphia

arise from these data. First, there appears to be a direct linear relationship between the number of pupils from low income families and the implementation models. Second, in this relationship, the per capita expenditures for pupils and teachers increases accordingly, as well as simultaneously, providing an equivalence in total per capita expenditures across the models with respect to other budgetary inputs from operating capital. Third, although a significant difference exists between the models in terms of aggregate Title I funds (SAF-4), this appropriation is consistent with the increasing need for improved pupil performance in basic skills (AGD-R). These relationships are shown graphically in Figure 5.

Pupil Population Data

Through a systematic extraction and sorting procedure,* a 20% sample of pupils from 63 Title I and 47 non-Title I schools was obtained. A total of 6,826 cases was identified--5,683 Title I and 1,143 non-Title I. Each pupil case contained the May 1969 and 1970 ITBS scores in reading comprehension, total arithmetic, and Title I project exposure code(s). Of the 5,683 Title I cases, 815 or 14% were incomplete; of non-Title I, 76 or 7% were incomplete.** Table 11 shows the distribution of the sample by grade and model (p. 45).

To obtain an estimate of the range and levels of performance in reading and arithmetic of the Title I pupils in the total sample, two frequency distributions of their May 1970 scores were constructed. These distributions are shown in Figure 6, where the median population scores in

*Pupil History File, SKYDAS, Division of Administrative and Survey Research.

**Incomplete means the absence of standardized scores.

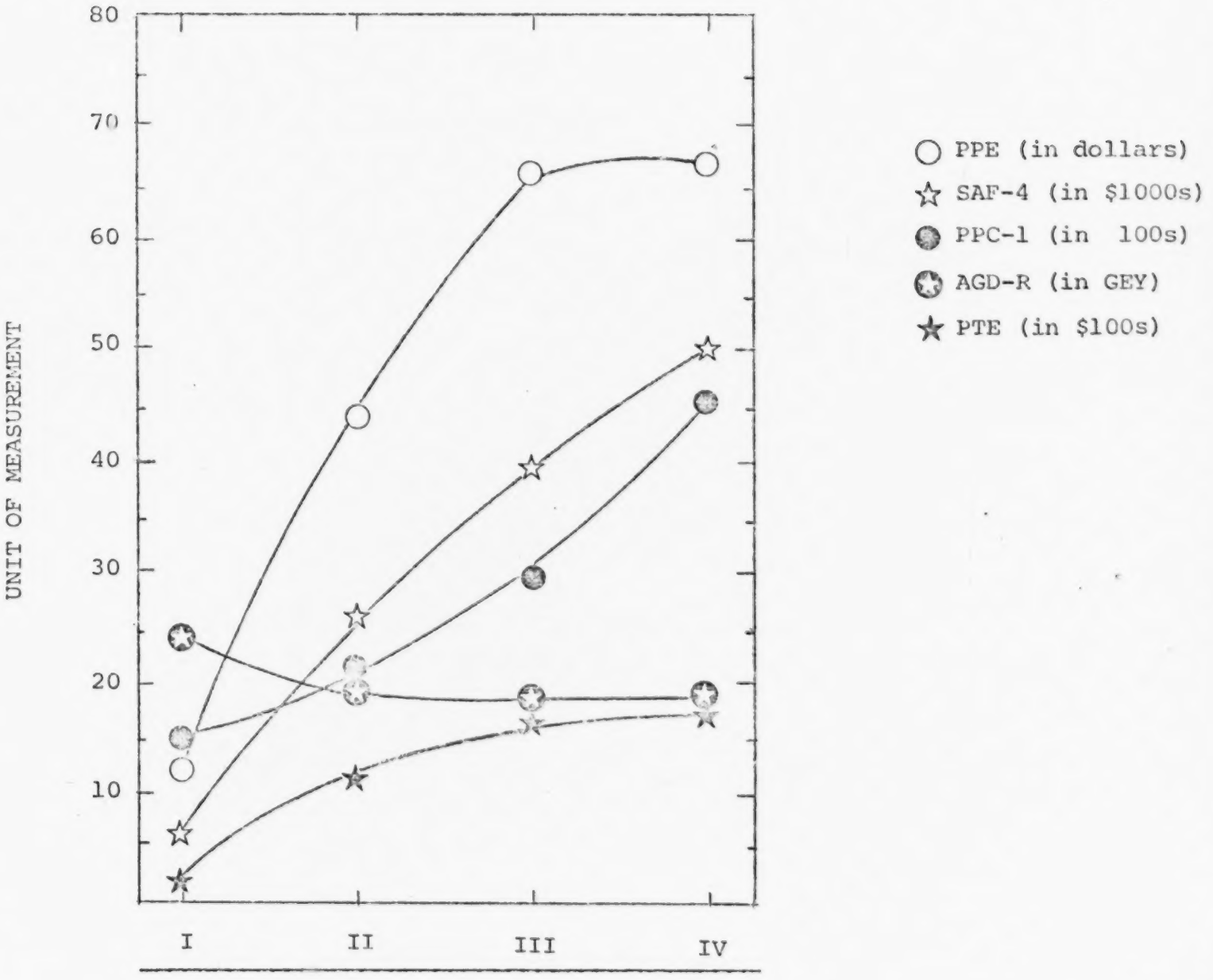


Figure 5. Functional relationships between Implementation Models and five systematic program variables.

TABLE 11

Distribution by Model and Grade of the 6,828 Pupils Involved in the FY 1969-1970 Sample

Grade	Models					Total
	0[a]	1	2	3	4	
3	301	217	277	576	413	1784
4	295	215	248	555	355	1668
5	279	255	231	524	388	1677
6	268	242	245	565	377	1697
Total	1143	929	1001	2220	1533	6826

*Model 0 = Non-Title I elementary schools.

reading (Md. = 3.2) and arithmetic (Md. = 4.0) are presented. Although a "goodness-of-fitness" analysis was not performed, the two distributions appear to approximate normal curves, with the greater trailing occurring in reading performance.

To compare the distribution of total pupil performance in Title I schools with that of non-Title I schools, individual pupil scores were transformed into quartile ranks using the 1966 pupil conversion tables provided by the test publisher (ITBS). Each score was placed within the appropriate quartile range according to the grade of the pupil. Finally, the frequencies within each quartile were summarized across the grades to produce the distributions shown in Figure 7 (p. 47). These distributions show that the performance patterns of pupils in Title I and non-Title I schools are significantly different. However, the distribution of reading and arithmetic scores within the two populations are similar.

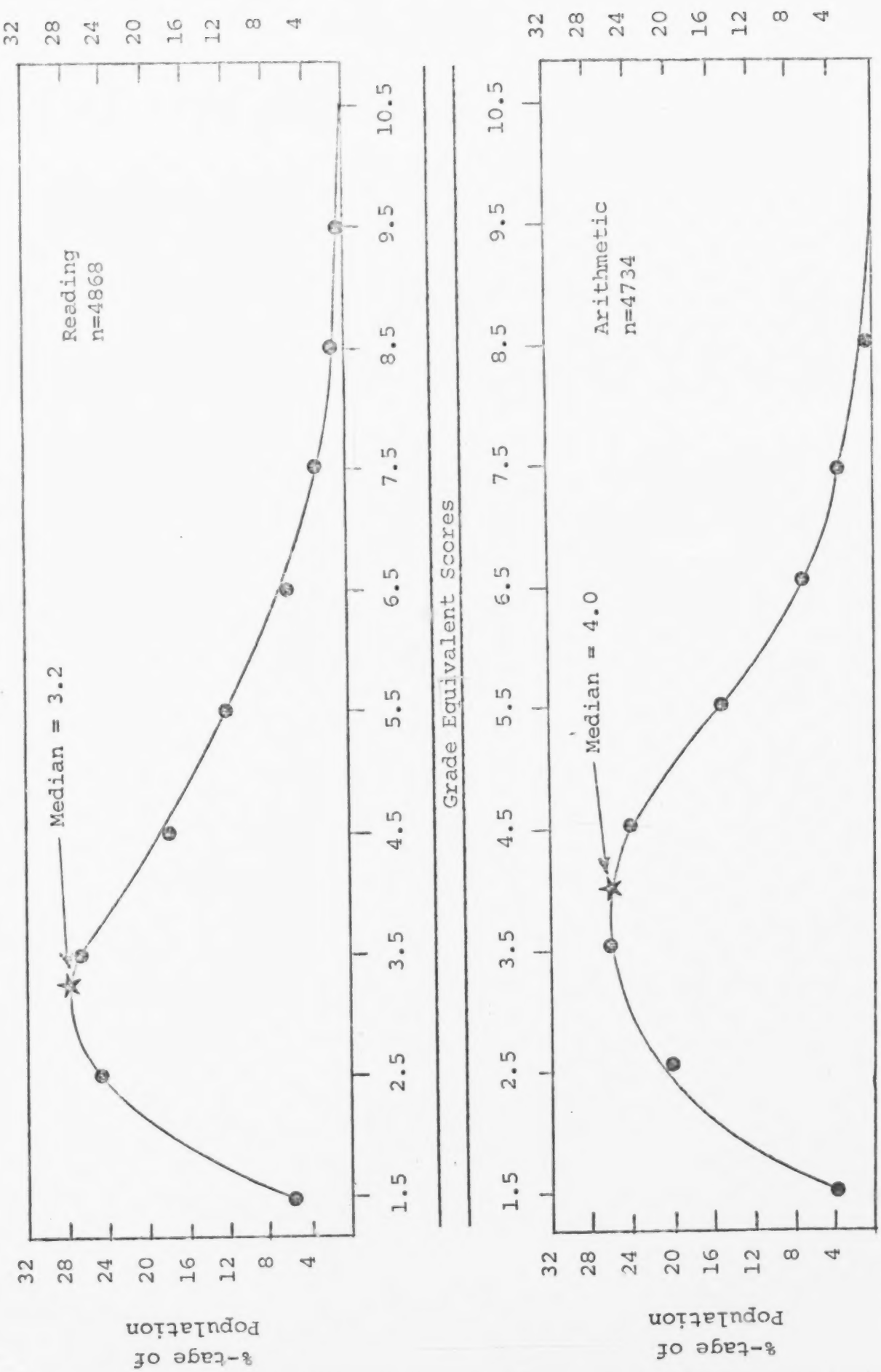


Figure 6. Distribution of the combined 3rd-, 4th-, 5th-, and 6th-grade reading and arithmetic scores of a 20% systematic sample of pupils in 63 Title I elementary schools, May 1970.

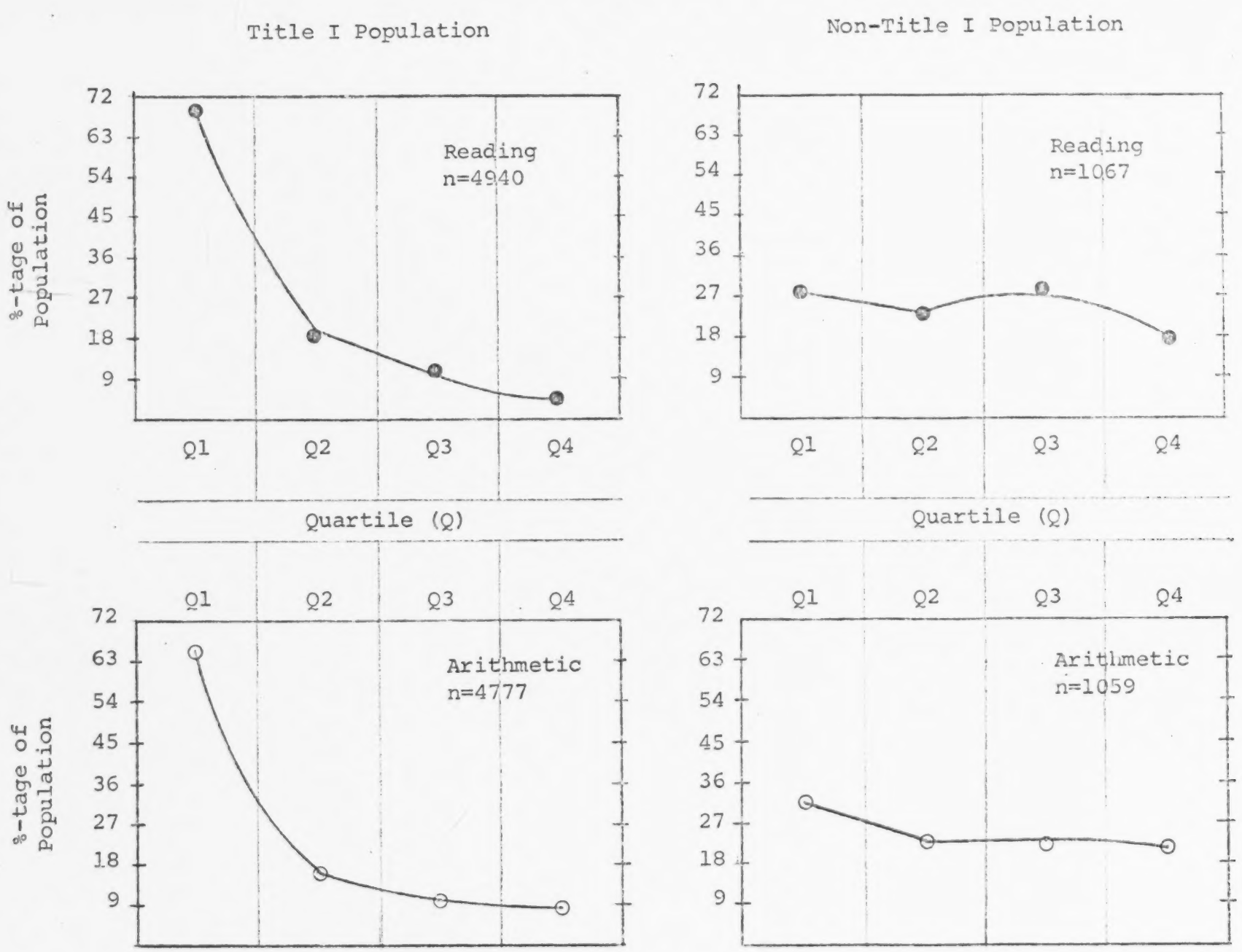


Figure 7. Distribution by quartile of the combined Title I and non-Title I pupil performance scores in reading and arithmetic, where quartile placements were obtained from individual grade distributions.

It should be noted (a) that for non-Title I schools each quartile contains about 25% of the pupil population and (b) that for Title I schools almost 65% of the pupils placed in the first quartile and 7% placed in the fourth quartile. Ostensively, about 21% of pupils in both populations placed in the second quartile.

To determine whether differences between the distribution of reading and arithmetic scores across the four implementation models identified through the impact analysis procedure existed, individual quartile distributions were developed for each model. Figure 8 shows these distributions. This figure demonstrates that implementation model 1 (M-1) is distinctly different from those of the other Title I implementation models (M-2, M-3, and M-4). When M-1 was compared with the non-Title I schools' (M-0) performance, the major difference between them was the percentage of pupils in the first quartile (Q-1). Like comparisons across the other models revealed (a) that the distribution curves in reading and arithmetic scores were similar and (b) that the majority (69%+) of their pupils were in Q-1.

Figures 9 and 10, on pages 50 and 51, give the quartile distributions for each model by grade. A review of these grade distributions revealed (a) that the percent of pupils in Q-1 increased from grade to grade, (b) that the percent of pupils in Q-3 and Q-4 remained fairly constant, and (c) that the percent of pupils in Q-2 decreased, which seemed to imply that the pupils at this level tended to become less productive as they move from grade to grade.

A quantitative analysis was performed to determine whether significant differences existed between grades 3 through 6 for each model.

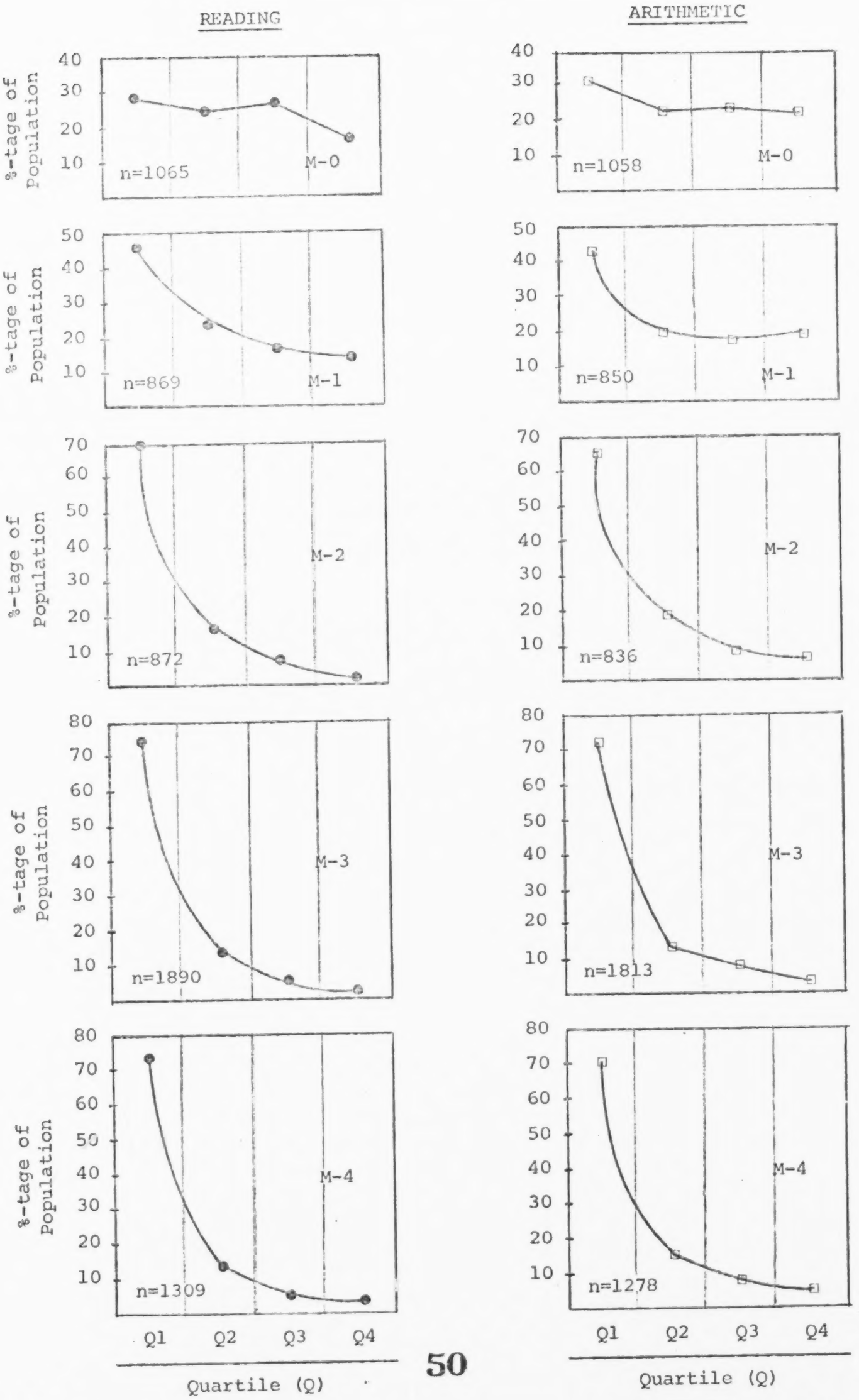


Figure 8. Distribution of the aggregate reading and arithmetic scores of the non-Title I (M-0) and Title I (M1-4) pupil populations.

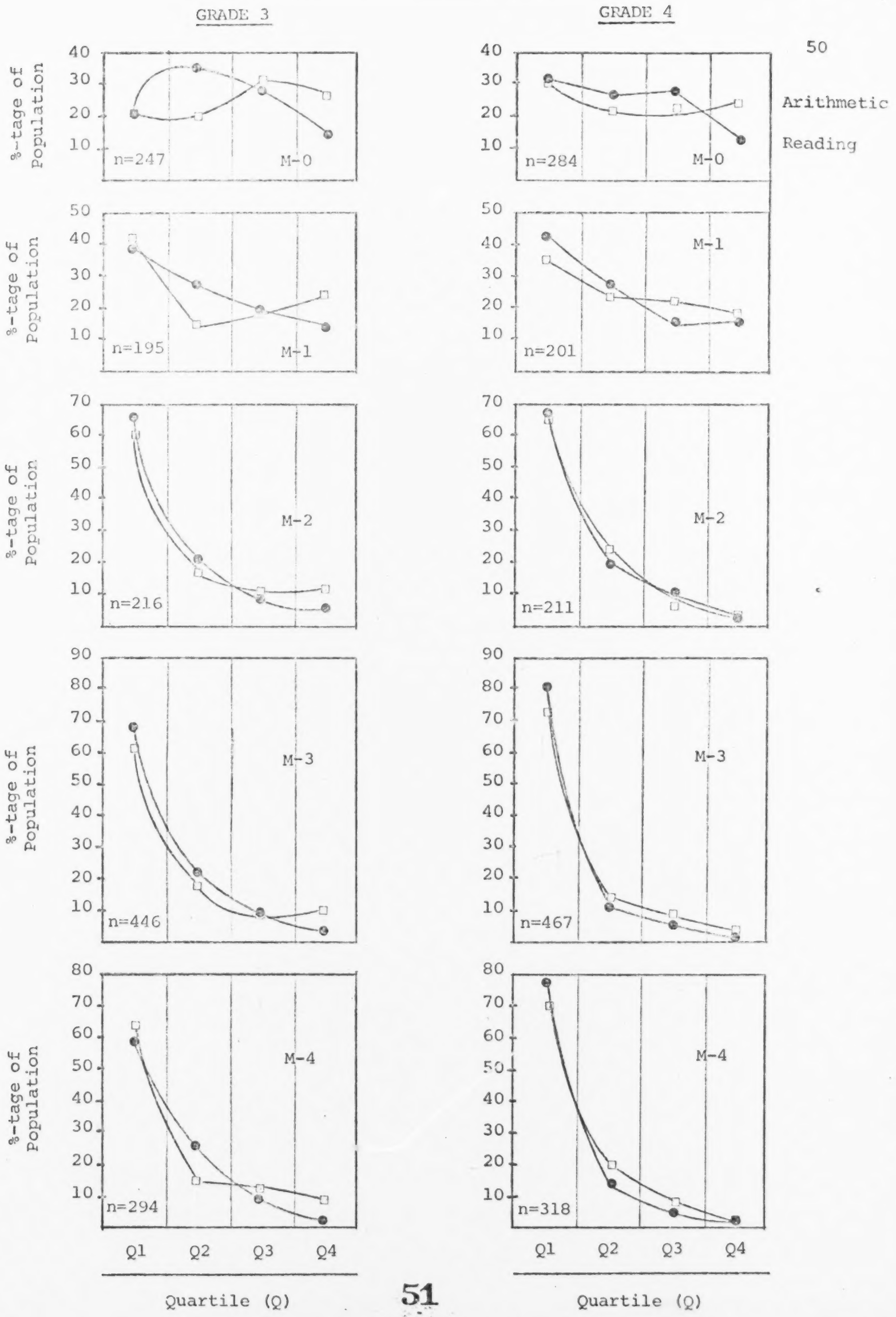


Figure 9. Performance distributions by grade-within-models.

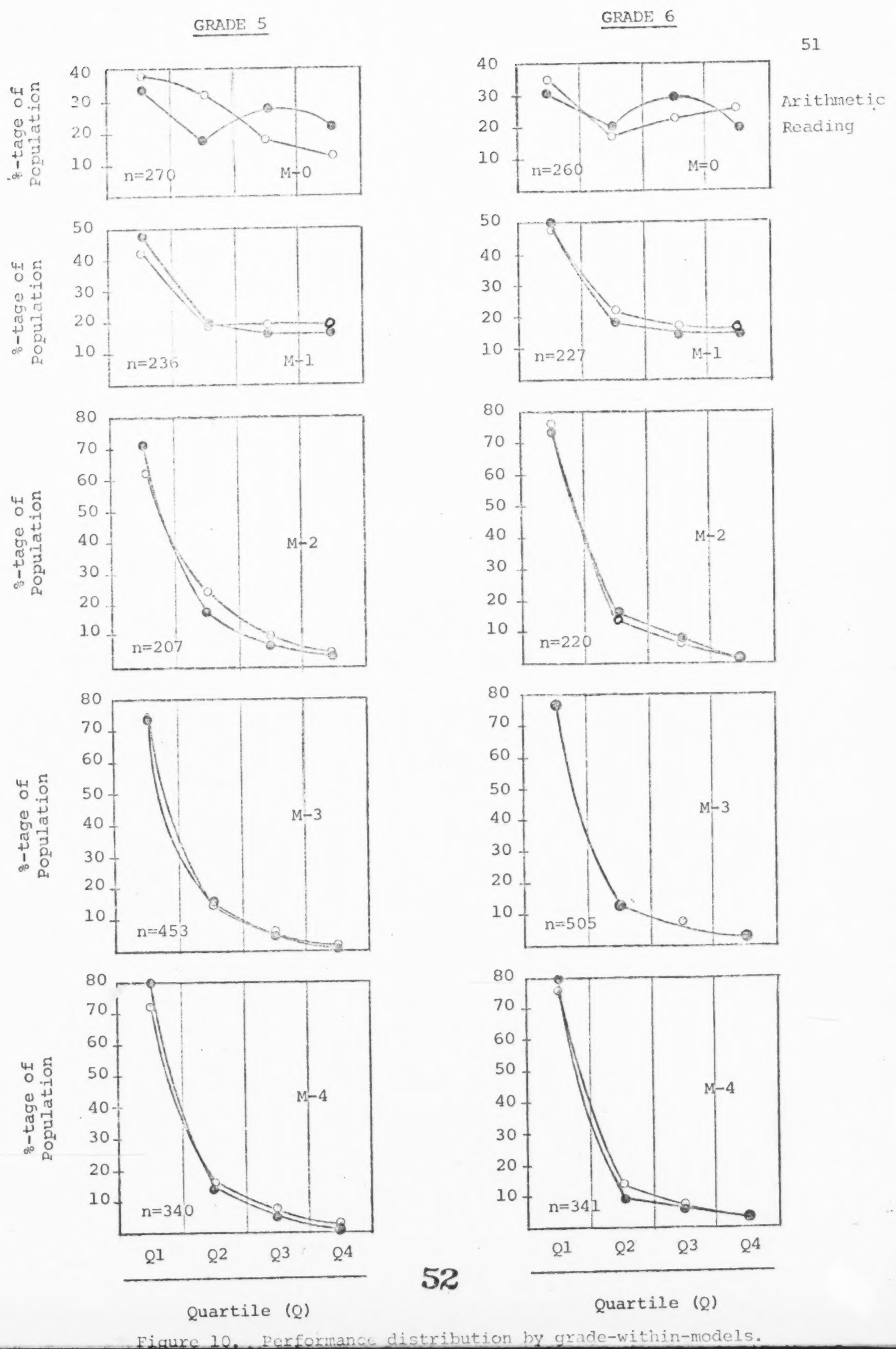


Figure 10. Performance distribution by grade-within-models.

The mean scores, standard deviations, and F ratios from the analyses of reading and arithmetic scores are given in Tables 12 and 13. The analyses of variance showed that pupil performance between the grades was significant ($p < .001$). Perusal of the data indicate that significant differences in performance also existed between the models at each grade.

The mean reading and arithmetic scores of each grade within the models were plotted to compare the trend of pupil performance across the models. Figures 11 and 12 contain isobars of pupil performance in reading and arithmetic. In Figure 11, it was observed that the intervals between the mean grade reading scores of pupils in non-Title I schools were not equal. The distance between grades 3 to 4 ($\overline{3,4}$) was less than the distance between grades 4 to 5 ($\overline{4,5}$) and 5 to 6 ($\overline{5,6}$). However, the intervals between the mean grade scores for pupils in M-1 were constant. In M-3, little difference was noted between $\overline{3,4}$. Nevertheless, the intervals $\overline{4,5}$ and $\overline{5,6}$ were about equal and ten-times as great as $\overline{3,4}$.

The same kind of visual analysis was made for the arithmetic isobars shown in Figure 12 on page 56. This figure shows that the mean performance scores in grades 3, 4, and 5 of non-Title I schools, M-1, and M-2 were not significantly different. A difference of 0.5 GE points did exist between these groups at grade six.

Having an interest in establishing performance curves for Title I pupils in Philadelphia, a series of reading and arithmetic performance ogives were developed. Figure 13 presents the reading performance ogives for grades 3 through 6. Figure 14 presents the arithmetic ogives. The purpose for constructing these ogives was to establish a method for ascertaining the relative rank a given individual or mean score would have

TABLE 12

Means, Standard Deviations, and Tests for Significance Between School Grade Means in Reading[a]

School Model		Reading Performance Parameters	Grades 3	4	5	6	Combined Grades	Test for Significance of Difference Between Grades[b]
Non-Title I		Mean	3.9	4.6	5.5	6.7	5.2	$F_{(3,1064)} = 174$
		Std. Dev.	1.2	1.3	1.6	1.7	1.8	
Title I Implementation:	1	Mean	3.5	4.3	5.2	6.0	4.8	$F_{(3,863)} = 90$
		Std. Dev.	1.2	1.5	1.8	1.8	1.8	
	2	Mean	2.9	3.4	4.1	4.8	3.8	$F_{(3,876)} = 88$
		Std. Dev.	1.0	1.2	1.4	1.5	1.5	
	3	Mean	2.9	3.1	3.9	4.7	3.7	$F_{(3,1894)} = 194$
		Std. Dev.	1.0	1.1	1.3	1.6	1.5	
	4	Mean	2.9	3.2	3.9	4.7	3.7	$F_{(3,1315)} = 112$
		Std. Dev.	1.0	1.3	1.3	1.6	1.5	

[a]Iowa Tests of Basic Skills, May 1970.

[b]All F-values are significant beyond the .001 level.

TABLE 13

Means, Standard Deviations, and Tests for Significance Between School Grade Means in Arithmetic[a]

School Model		Reading Performance Parameters	Grades 3	4	5	6	Combined Grades	Test for Significance of Difference Between Grades[b]
Non-Title I		Mean Std. Dev.	4.0 1.0	4.8 1.1	5.5 1.4	6.7 1.6	5.2 1.6	$F_{(3,1056)} = 190$[b]
Title I Implementation:	1	Mean Std. Dev.	3.8 1.2	4.7 1.3	5.4 1.5	6.2 1.6	5.1 1.6	$F_{(3,850)} = 112$
	2	Mean Std. Dev.	3.8 1.0	4.7 1.1	5.4 1.2	6.2 1.3	5.1 1.4	$F_{(3,841)} = 109$
	3	Mean Std. Dev.	3.1 1.0	3.5 1.0	4.2 1.2	5.0 1.4	4.0 1.4	$F_{(3,1843)} = 220$
	4	Mean Std. Dev.	3.0 1.0	3.5 1.1	4.2 1.2	5.0 1.4	4.0 1.4	$F_{(3,1271)} = 166$

[a]Iowa Tests of Basic Skills, May 1970.

[b]All F-values are significant beyond the .001 level.

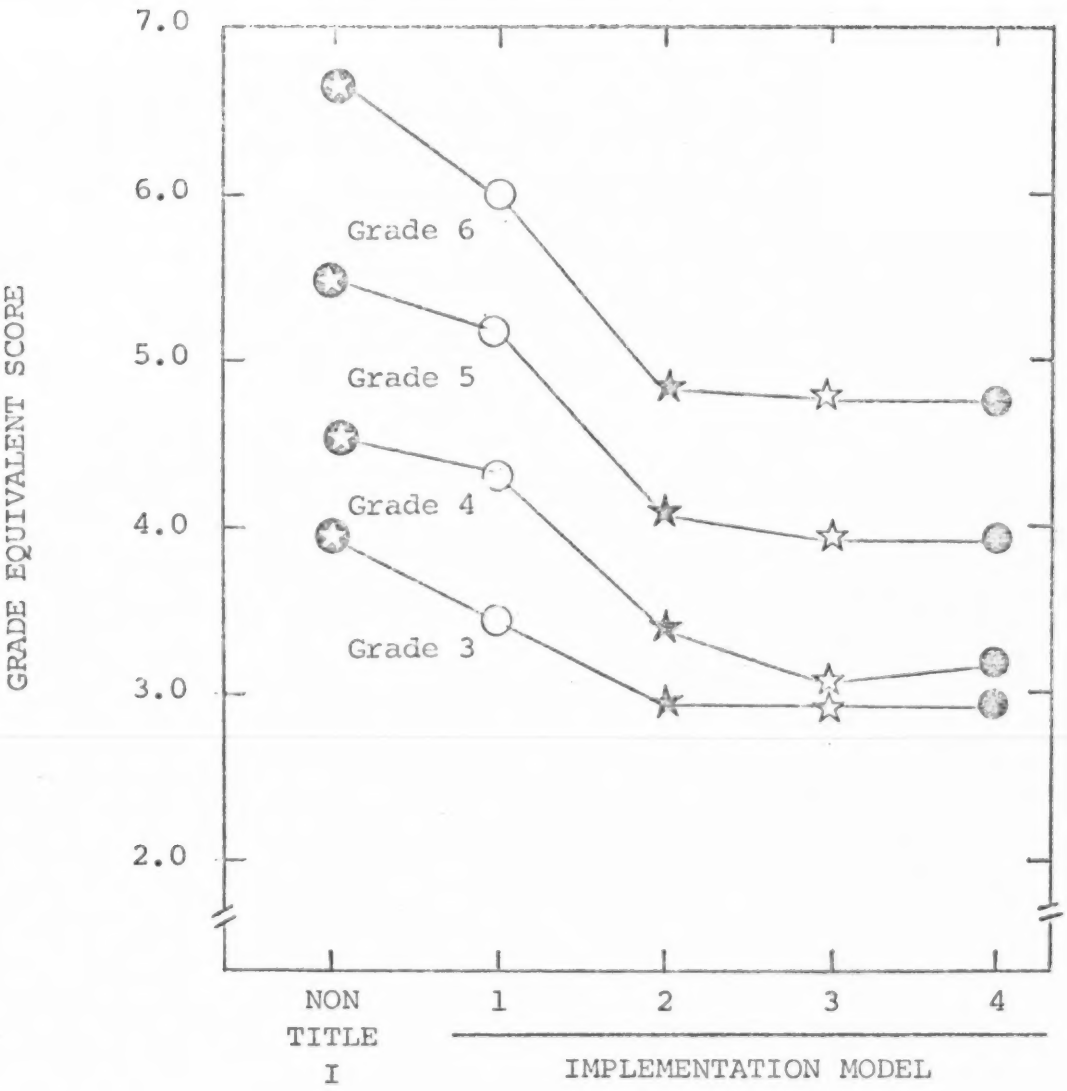


Figure 11. Mean reading performance score (ITBS) isobars of the stratified sample.

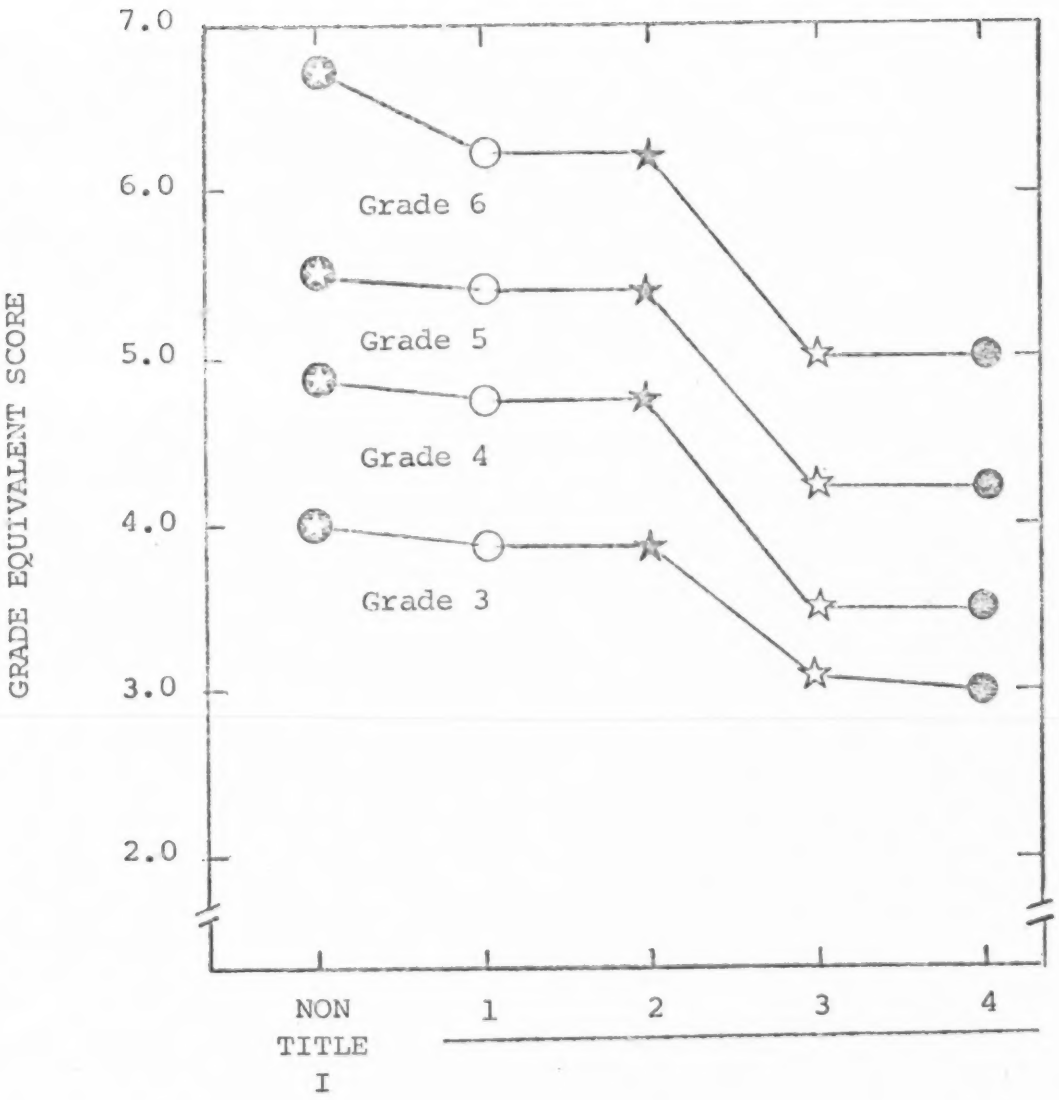


Figure 12. Mean arithmetic performance score (ITBS) isobars of the stratified sample.

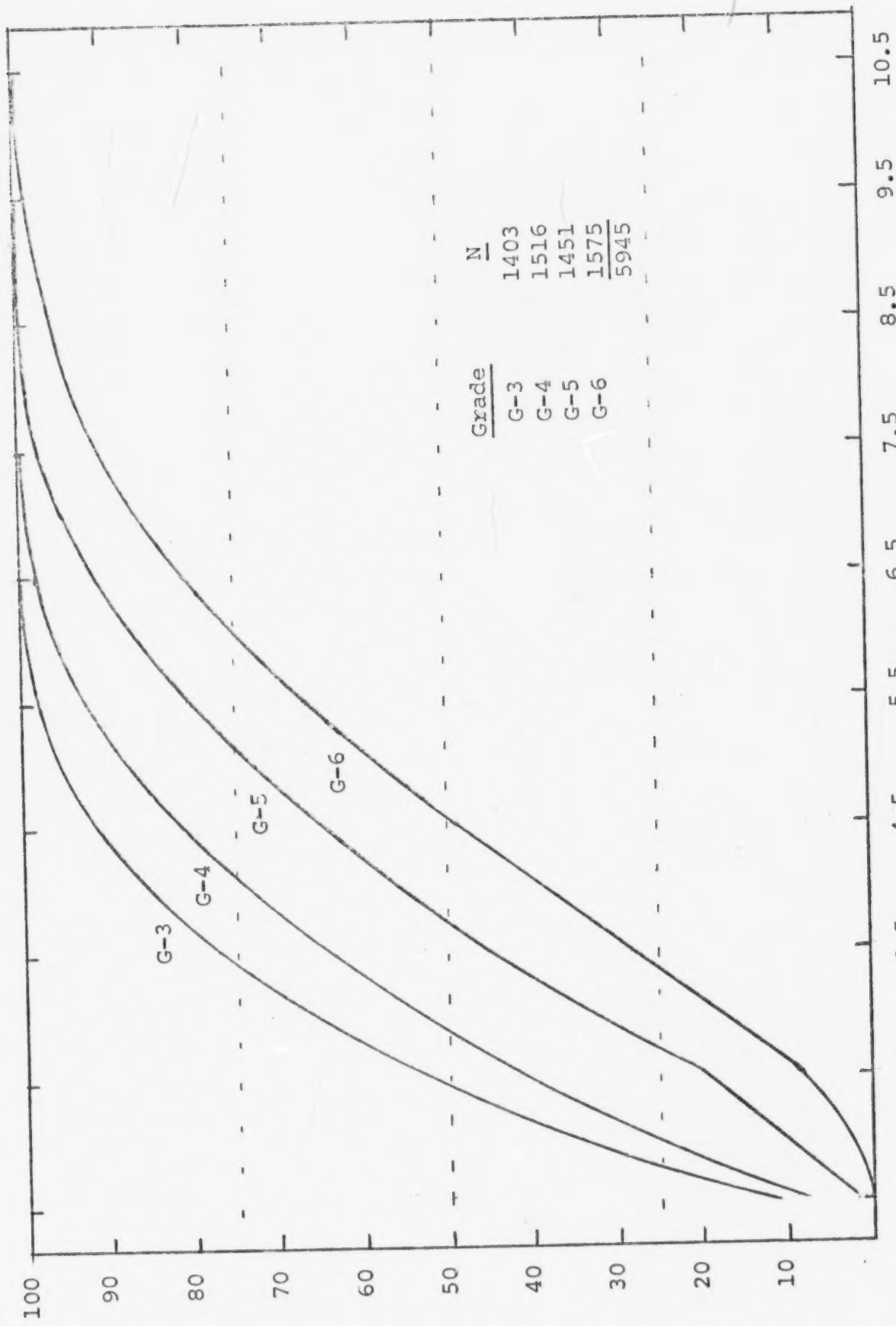


Figure 13. Total population reading performance (ITBS) ogives, May, 1970.

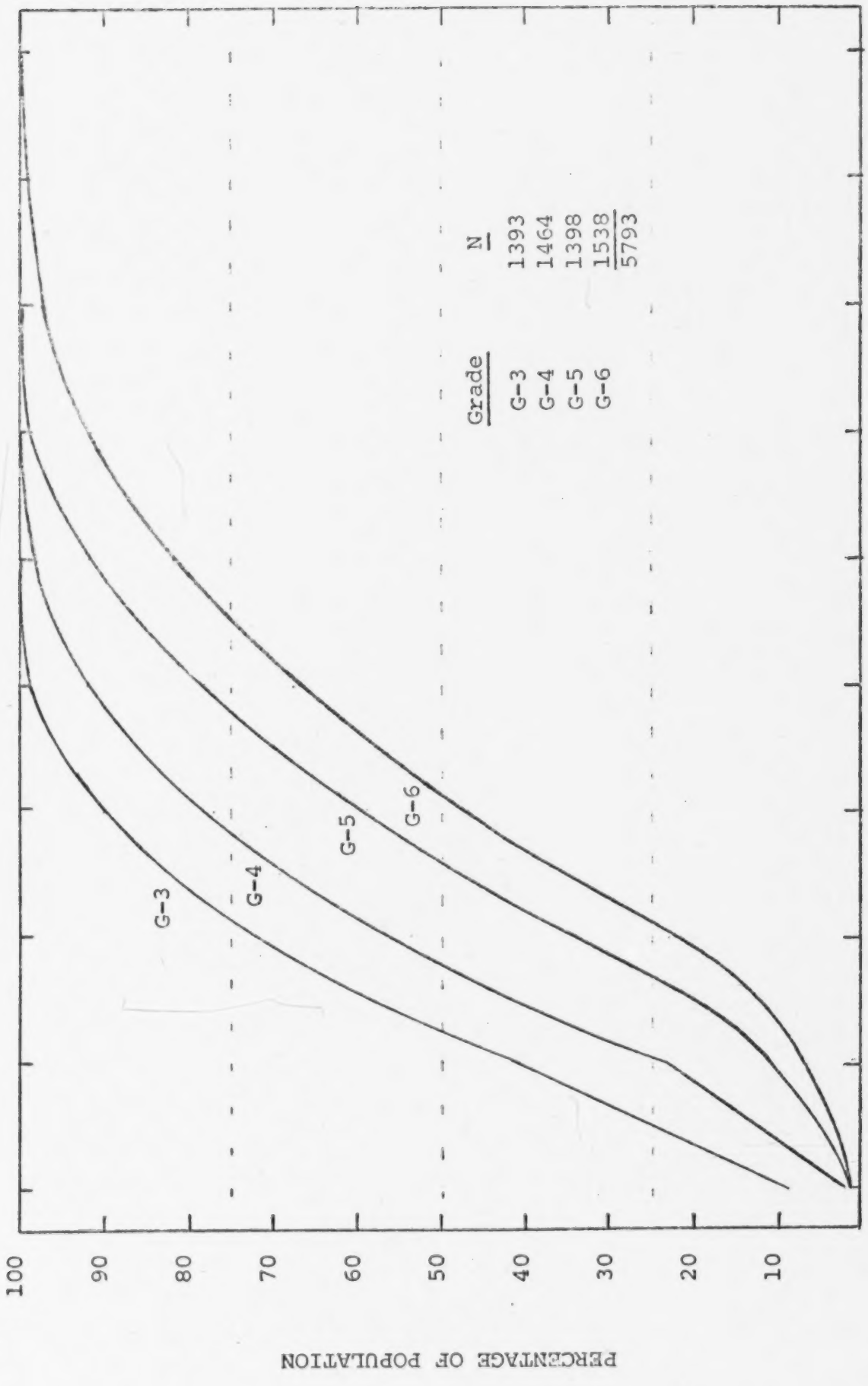


Figure 14. Total population arithmetic performance (ITBS) ogives, May, 1970.

in the distribution of probable performance scores. For example, a sixth-grade pupil having a score of 4.5 in reading would be performing at the 49th percentile or as an average sixth-grade pupil in a Title I school. A sixth-grade pupil having a score of 6.5 would be at the 81st percentile or a high-performing Title I pupil. Such comparisons could lead to a more effective means for comparing the performance of Title I pupils with respect to program inputs and school characteristics.

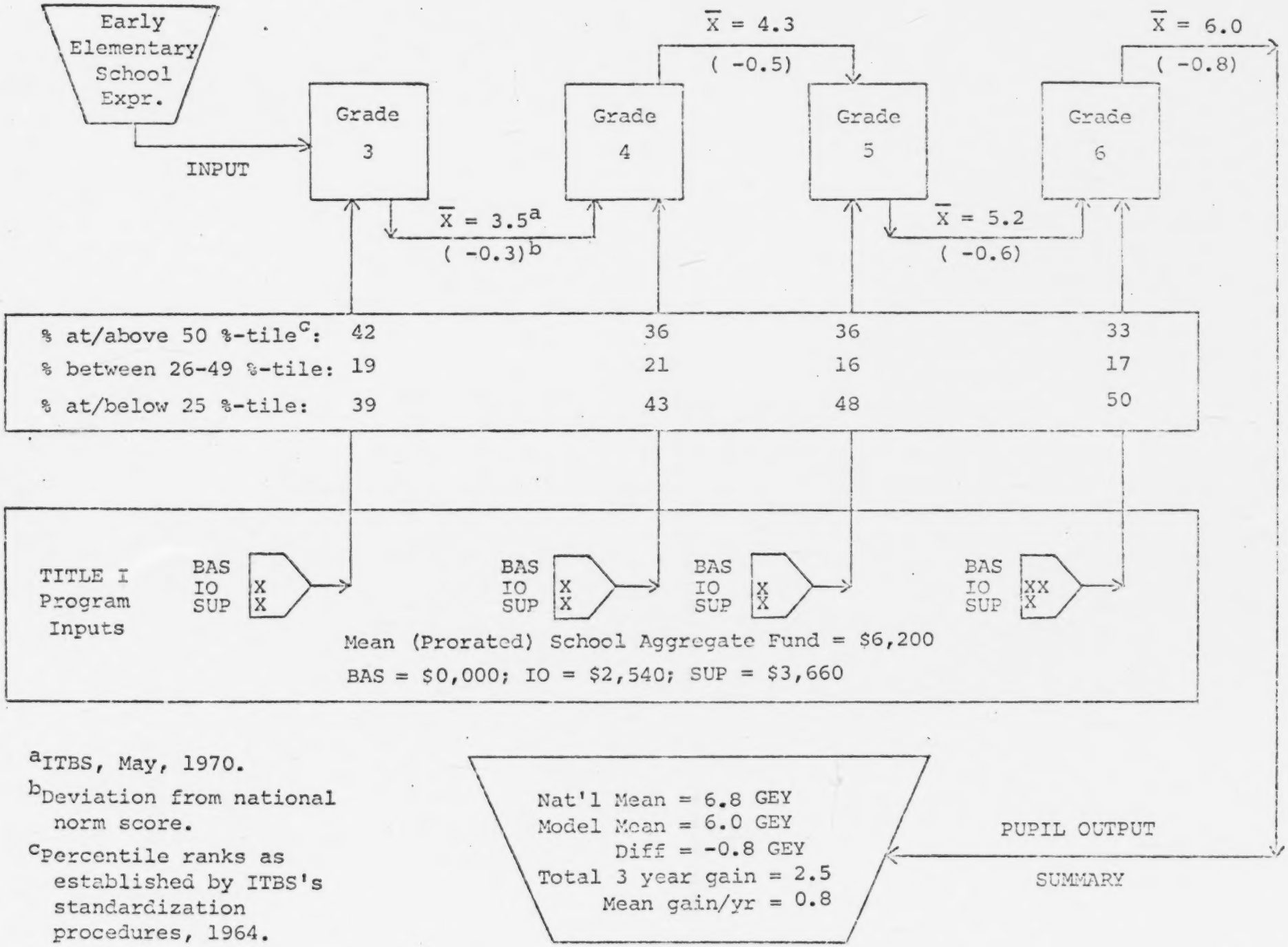
These ogives would also permit the classification of Title I pupils within a given grade or at particular schools. For example, if a third-grade class in a given school had a range of scores from 2.5 to 3.5, this class would consist of Title I pupils who exhibit the normal range of performance for third-grade classes--that is pupils who fail between Q2 and Q3 (50th to 76th percentiles).

Program Input/Pupil Output Characteristics

To ascertain whether the program inputs of the respective models were effecting systematic changes in pupil outputs and to determine whether the outputs observed from each model differed significantly, the previous data were combined to produce a series of Program Input/Pupil Output (PI/PO) schemata as is shown in Figure 15.

Model 1

Reading. This figure is the PI/PO schema for M-1 in reading comprehension. The figure contains (a) the mean grade-within model scores in reading for grades 3 to 6, (b) the difference between the mean grade-within model score and the national norm--see parentheses, (c) the



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

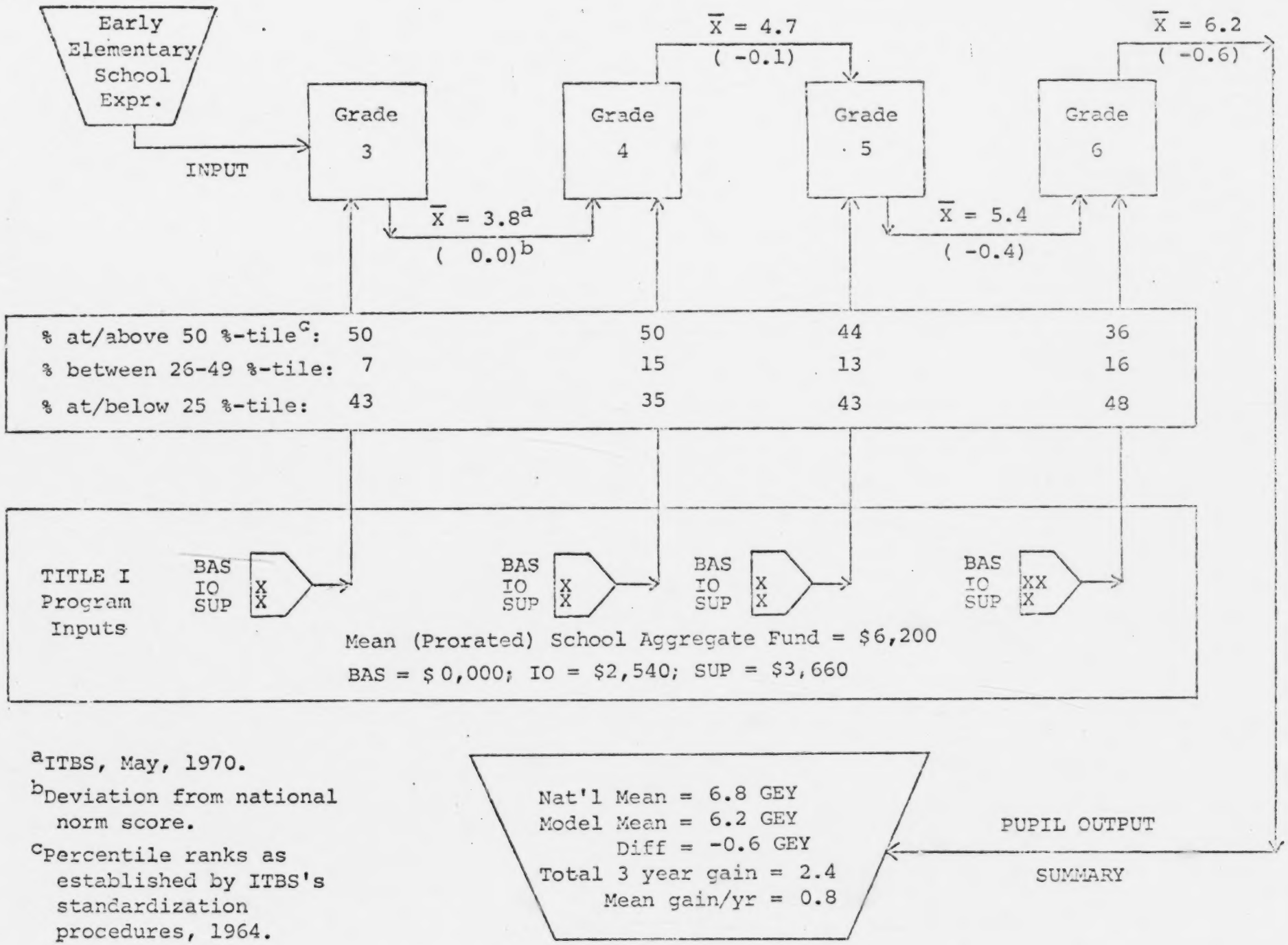
Figure 15. Model 1's program inputs for improved pupil outputs in reading achievement.

distribution of pupil scores at three quartiles--Q_1, Q_2, and Q_3-Q_4, located in the rectangle, (d) the kinds and levels of Title I program inputs each grade received, (e) the mean amounts of total and categorical monies allocated to the model, (f) the total and mean gains the average pupil attained at the end of each grade.

These data showed that the average pupil in grade 3 is 0.3 GE below the national norm. It appeared as if this deficiency continued at a rate of 0.17 GE/year over grades 4 to 6, thereby, producing a cumulative loss of 0.8 GE at the end of grade 6. Second, the data indicated that (a) the proportion of pupils at or above the 50th national percentile (Q_3-Q_4) decreased by 9% over the grades and (b) that an increase of 11% occurred in the number of pupils scoring at or below the 25th national percentile (Q_1). Those within the 26-49th national percentile (Q_2) varied by 1.8%.

Third a constant investment in IO and SUP pupil service components (PSCs) was provided for all grades. Fourth, the average amounts of monies spent for the PSC projects were: $2,540 for IO and $3,660 for SUP. Fifth, the pupil output summary showed (a) that the average sixth-grade pupil was 0.8 GE behind in reading and (b) that the combined investments produced a total gain of 2.5 GEY over the three grades or an average gain of 0.8 GE per school year. However, 33% (287) of the sixth-grade pupils were at or above the national norm.

Arithmetic. In Figure 16, the system for reporting grade performance in reading is repeated for arithmetic performance. Changes in the proportion of pupils at Q_3-Q_4 decreased by 14%. The proportion of pupils in Q_2 increased by 9%. Those in Q_1 increased by 5%. The



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

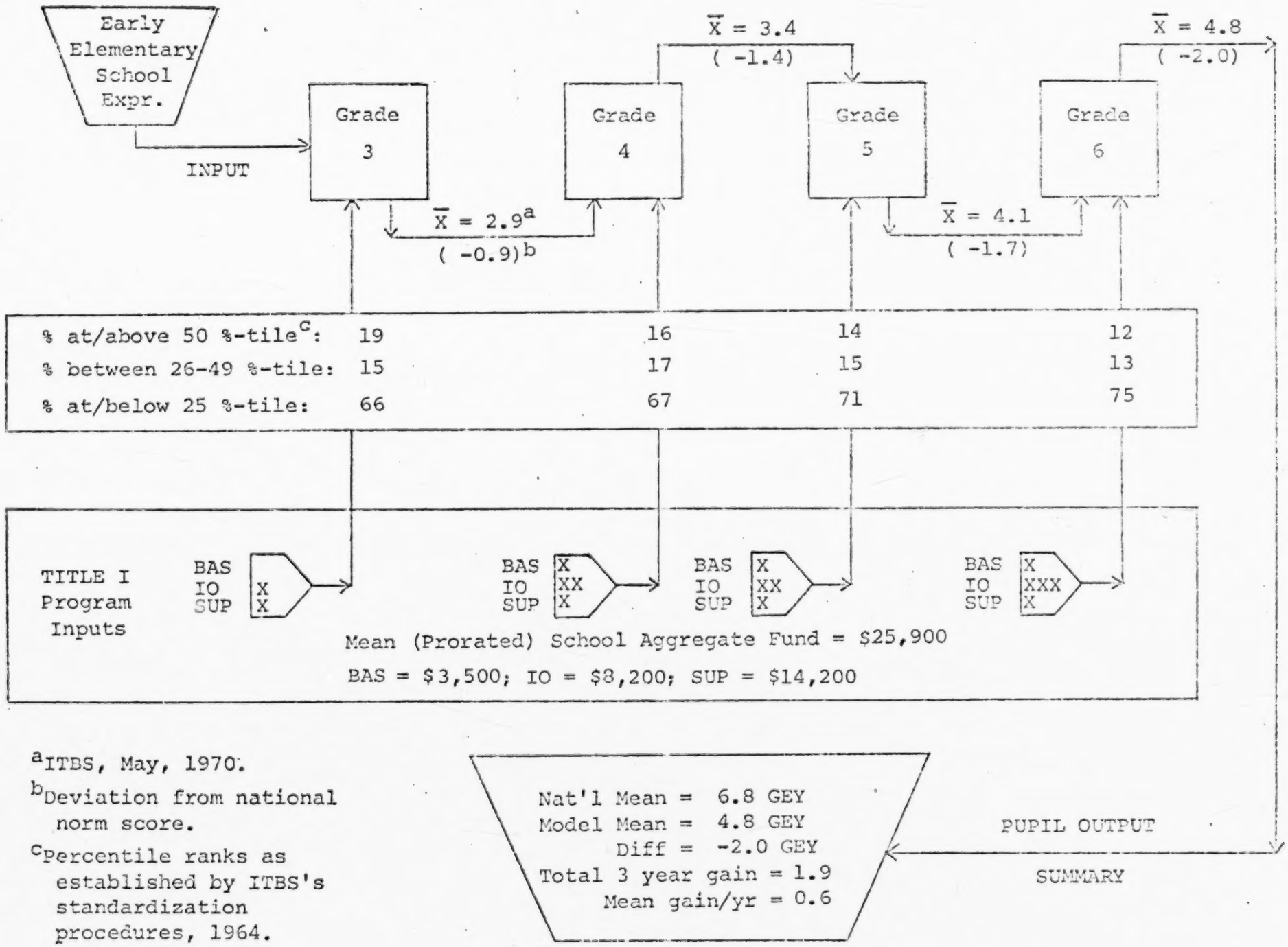
Figure 16. Model 1's program inputs for improved pupil outputs in arithmetic achievement.

assignment of PSC projects to the grades remained the same. Although the drop in pupil performance below national expectation occurred at the end of grade 5, the total gain over the three grades was 2.4 GEY or 0.8 GE per school year. However, 36% (306) of the sixth-grade pupils were at or above the national norm.

School achievement control strategy. According to the classification of Title I project content variables which control school variance--shown in Table 1, the combination of IO + SUP (Bloom's variables = 2 + 3) suggested a systematic input system for controlling the affective aspects of education by improving the teacher's capability to understand and utilize changes in pupil attitudes (self-perception) as a means for motivating the pupils to perform at their potential. Since these pupils were almost performing at national expectation, an inherent assumption of this model seemed to be that its schools have formulated instructional programs which meet the needs of the majority of its pupils.

Model 2

Reading. In Figure 17, the data indicate that the average third-grade pupil completed the year with a reading score of 2.9, which is 0.9 GE below the national norm. This deficiency increased to 2.0 GE at grade 6. The proportion of pupils in Q_3-Q_4 dropped from 19% at grade 3 to 12% at grade 6, a loss of 7%. Increased proportion of pupils appeared in Q_1, from 66% in grade 3 to 75% in grade 6. The number and kinds of PSCs provided to the grades increased across the grades from a minimum of two at grade 3 to a maximum of five at grade 6. BAS projects occurred from grade 4 through 6. The average amounts of monies spent for the PSCs


Early Elementary School Expr.
INPUT
Grade 3
Grade 4
Grade 5
Grade 6
X̄ = 3.4
(-1.4)
X̄ = 4.8
(-2.0)
X̄ = 2.9a
(-0.9)b
X̄ = 4.1
(-1.7)
% at/above 50 %-tile[c]: 19 16 14 12
% between 26-49 %-tile: 15 17 15 13
% at/below 25 %-tile: 66 67 71 75
TITLE I Program Inputs
BAS IO SUP X X
BAS IO SUP X XX X
BAS IO SUP X XX X
BAS IO SUP X XXX X
Mean (Prorated) School Aggregate Fund = $25,900
BAS = $3,500; IO = $8,200; SUP = $14,200
Nat'l Mean = 6.8 GEY
Model Mean = 4.8 GEY
Diff = -2.0 GEY
Total 3 year gain = 1.9
Mean gain/yr = 0.6
PUPIL OUTPUT
SUMMARY

[a]ITBS, May, 1970.

[b]Deviation from national norm score.

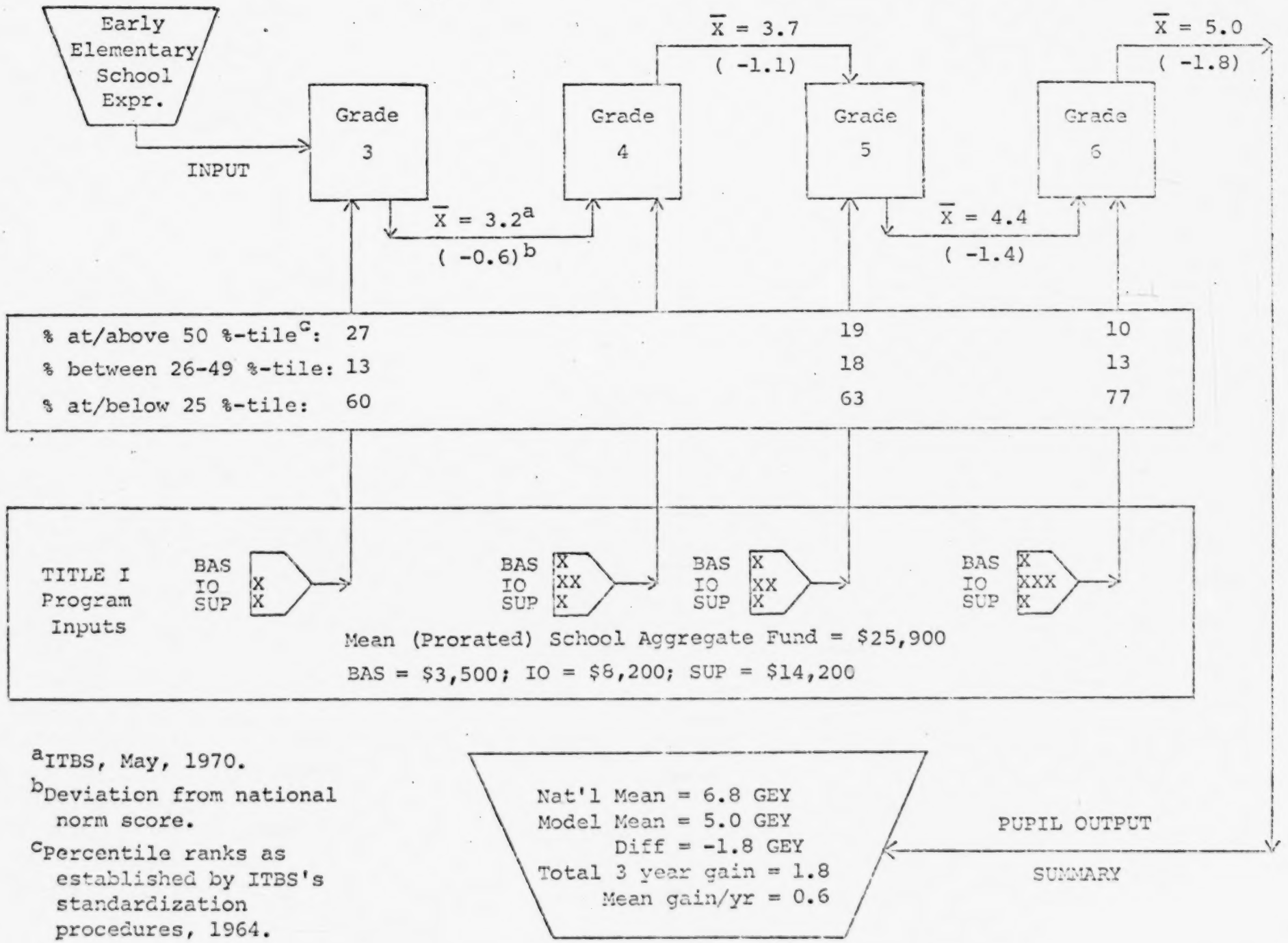
[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

Figure 17. Model 2's program inputs for improved pupil outputs in reading achievement.

were: $3,500 for BAS, $8,200 for IO, $14,200 for SUP. The pupil output summary showed (a) that the average sixth-grade pupil was behind 2.0 GE in reading and (b) that the combined investments produced a total gain of 1.9 GEY over the three grades or 0.6 GE per year. However, 12% (105) of the sixth-grade pupils were at or above the national norm.

Arithmetic. In Figure 18, the data indicate that the average third-grade pupil completed the grade with an arithmetic score of 3.2, which is 0.6 GE below the national norm. This deficiency increased to a loss of 1.8 GE at grade 6. The proportion of pupils in Q_3-Q_4 dropped by 17% across the grades. A slight fluctuation of $\pm$ 3% occurred in Q_2's proportions. A gain of 17% occurred across the grades in Q_1. The PSCs available to the grades produced a mean gain of 1.8 GEY across the grades or a gain of 0.6 GE in arithmetic. However, 10% (84) of the sixth-grade pupils were at or above the national norm.

School achievement control strategy. The configuration of PSCs within this model indicated that its systematic input system was directed toward controlling all factors which influence pupil performance (BAS + IO + SUP). The amounts of monies spent for the PSCs suggested that the heaviest emphasis was achieved through additional supportive materials and personnel. When compared to the previous model, the changes in expenditures for SUP ($10,540) was about two times as much for IO ($5,600), which was accompanied by an increase of $3,500 for BAS. The objective of this expenditure was to improve the capacity of its teachers to diagnose and manage classroom instructions. Cognizance was made of the pupil's needs for additional assistance in basic skill development (BAS). Likewise were monies available to improve the affective aspects of the pupil's education (SUP).



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

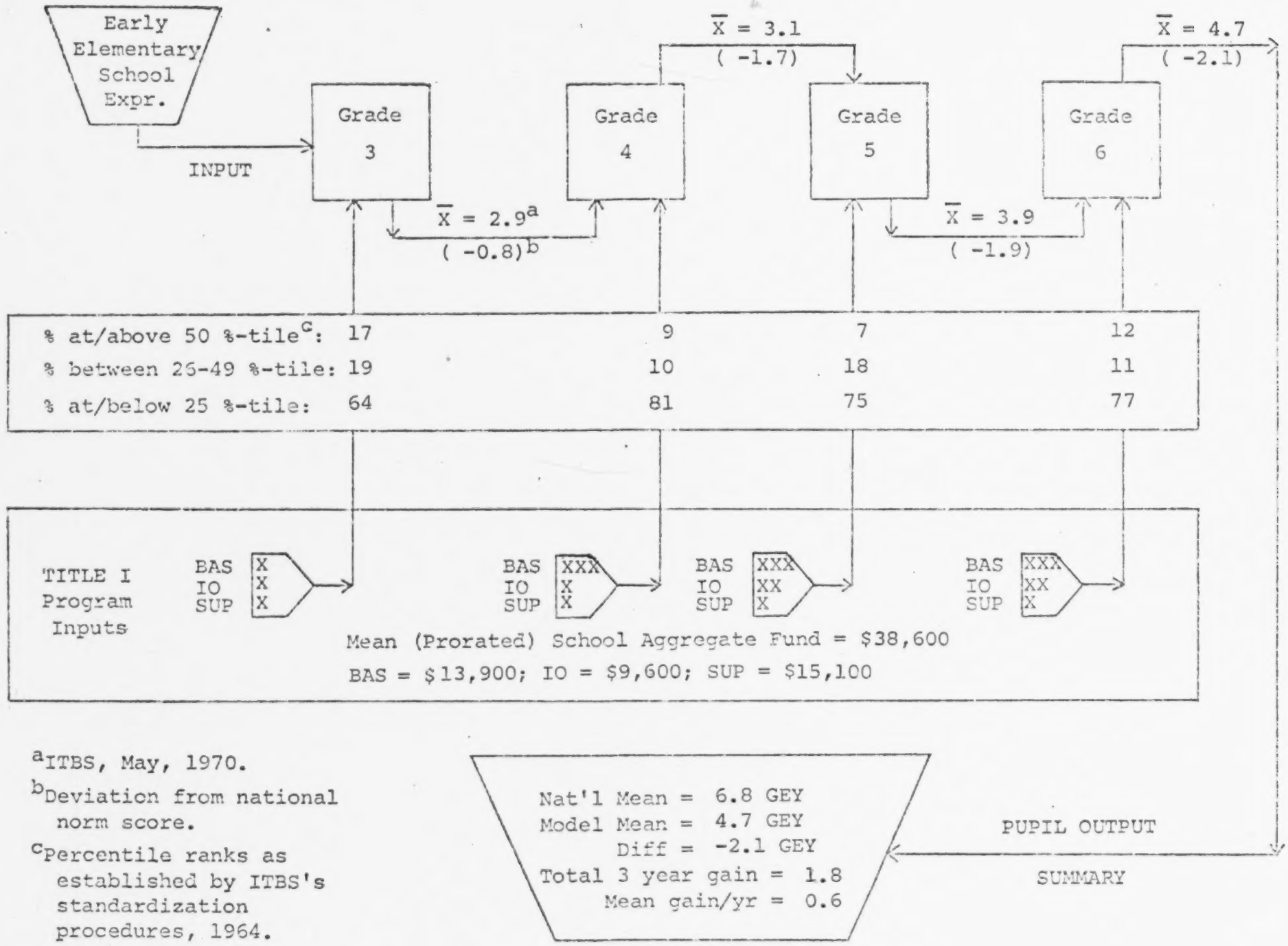
[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

Figure 18. Model 2's program inputs for improved pupil outputs in arithmetic achievement.

Model 3

Reading. In Figure 19, the data indicate that the average third-grade pupil completed the year with a reading score of 2.9, which is 0.9 GE below the national norm. This deficiency increased to 2.1 GE at grade 6. The proportion of pupils in Q_3-Q_4 decreased from 17% at grade 3 to 12% at grade 6. At Q_2 the percentage of pupils fluctuated across the grades, but ended up at 11% in grade 6. The proportions in Q_1 increased to a high of 81% at grade 4 and decreased to 77% at grade 6. The rise in the proportion of pupils in Q_3-Q_4, as well as the drop in Q_1, appeared to be attributed to the additional BAS projects placed in grades 4 to 6. The number and kinds of PSCs ranged from a minimum of three at grade 3 to a maximum of six over grades 4 to 6. The average amounts of monies spent for the PSCs were: $13,900 for BAS, $9,600 for IO, and $15,100 for SUP. The pupil output summary showed (a) that the average sixth-grade pupil was behind by 2.1 GE in reading and (b) that the combined investments produced a total gain of 1.8 GEY over the three grades or 0.6 GE per year. However, 12% (218) of the sixth-grade pupils were at or above the national norm.

Arithmetic. In Figure 20, the data indicate that the average third-grade pupil completed the grade with an arithmetic score of 3.1, which is 0.7 GE below the national norm. This deficiency increases to a loss of 1.8 GE at grade 6. The proportion of pupils in Q_3-Q_4 dropped by 15% across the grades. The proportion of pupils in Q_2 remained stable except at grade 4 where the amount increased to 17%. At Q_1 the proportions increased to a maximum of 78% at grade 6. The PSCs available to the grades produced a mean gain of 1.9 GEY across the grades or a gain of 0.6 GE per

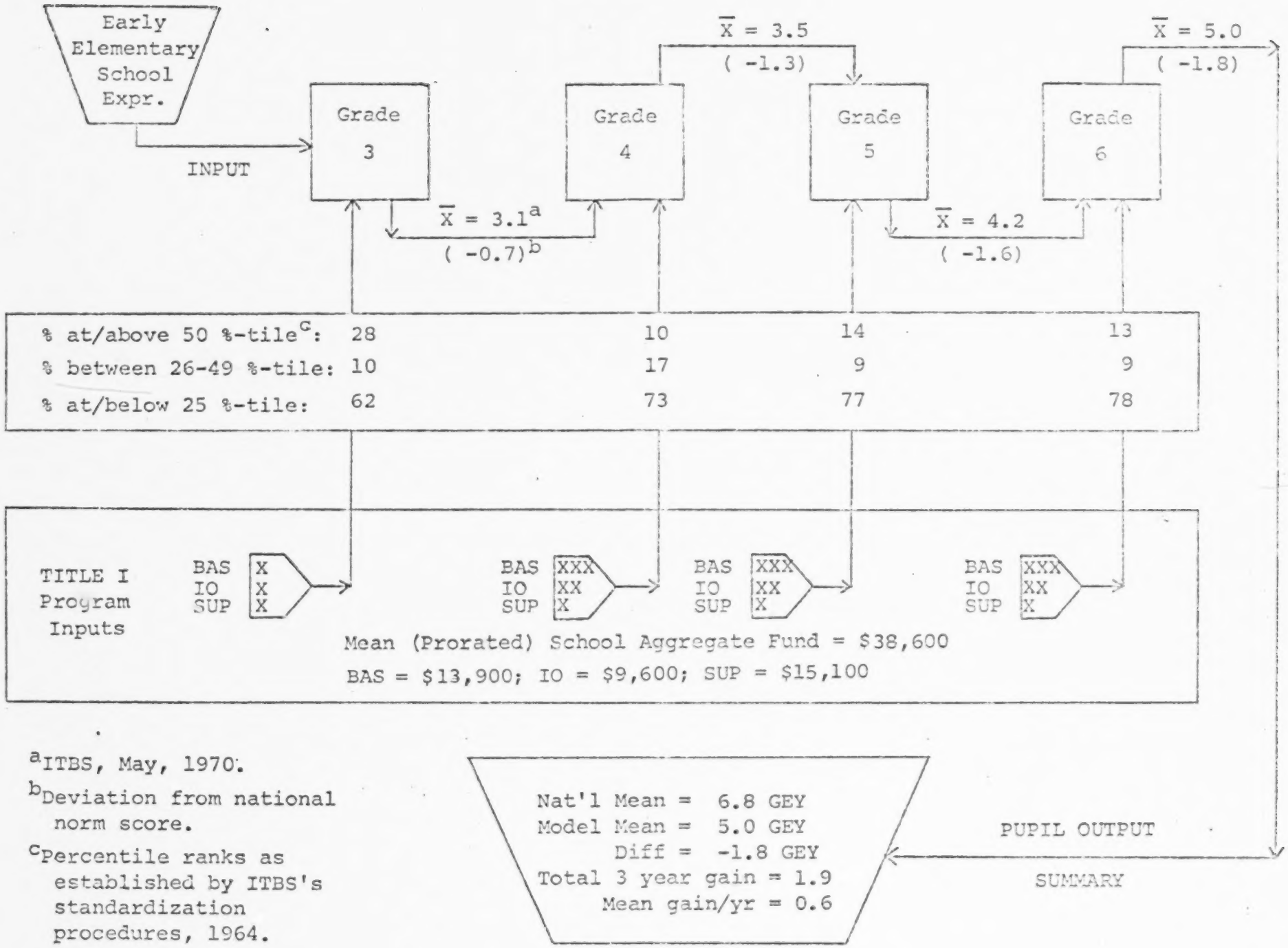

Early Elementary School Expr.
INPUT
Grade 3
Grade 4
Grade 5
Grade 6
$\overline{X}$ = 3.1
(-1.7)
$\overline{X}$ = 4.7
(-2.1)
$\overline{X}$ = 2.9[a]
(-0.8)[b]
$\overline{X}$ = 3.9
(-1.9)
% at/above 50 %-tile[c]: 17 9 7 12
% between 26-49 %-tile: 19 10 18 11
% at/below 25 %-tile: 64 81 75 77
TITLE I Program Inputs
BAS X IO X SUP X
BAS XXX IO X SUP X
BAS XXX IO XX SUP X
BAS XXX IO XX SUP X
Mean (Prorated) School Aggregate Fund = $38,600
BAS = $13,900; IO = $9,600; SUP = $15,100
Nat'l Mean = 6.8 GEY
Model Mean = 4.7 GEY
Diff = -2.1 GEY
Total 3 year gain = 1.8
Mean gain/yr = 0.6
PUPIL OUTPUT
SUMMARY

[a]ITBS, May, 1970.

[b]Deviation from national norm score.

[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

Figure 19. Model 3's program inputs for improved pupil outputs in reading achievement.



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

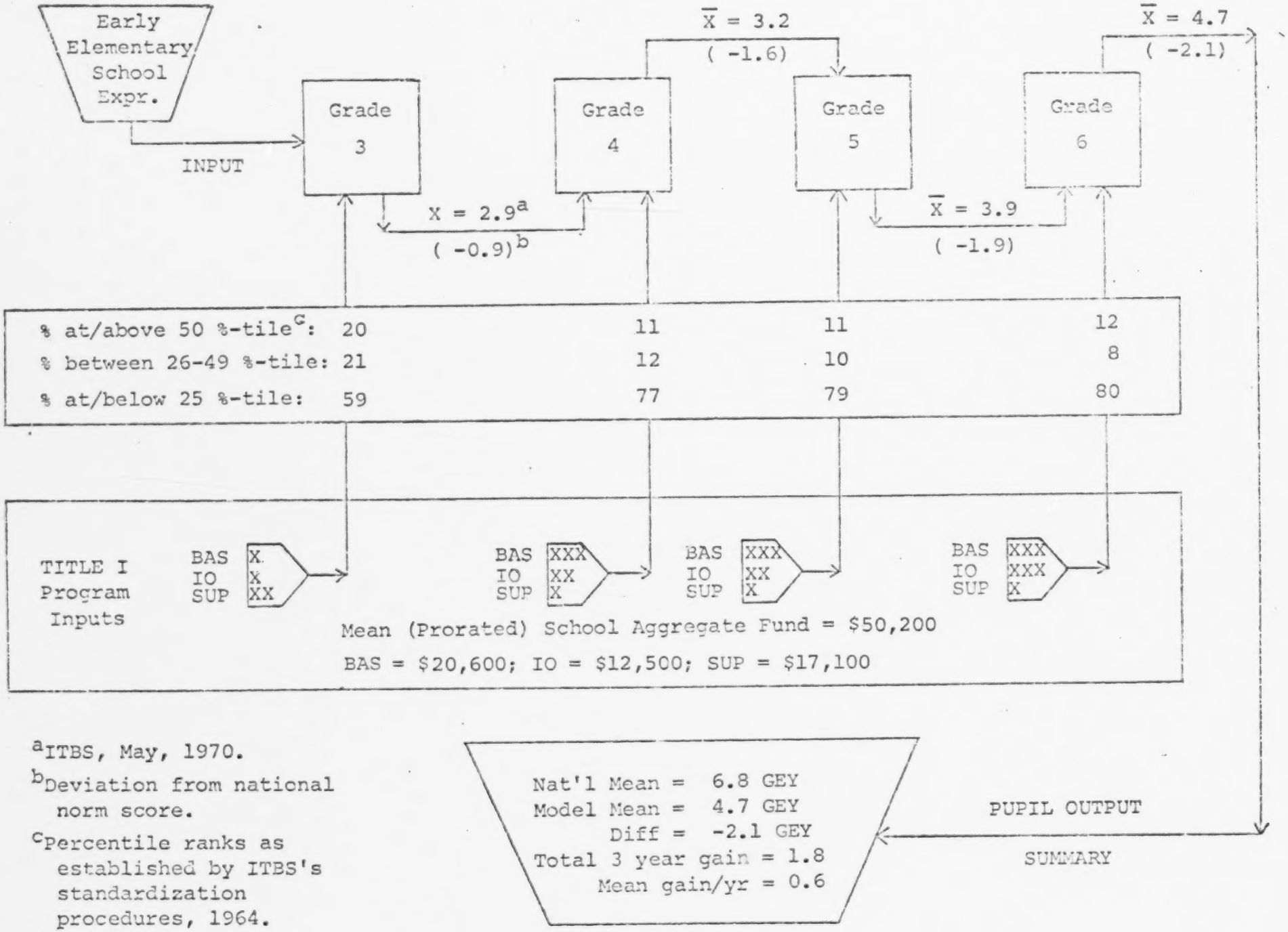
Figure 20. Model 3's program inputs for improved pupil outputs in arithmetic achievement.

year. The average sixth-grade pupil was behind 1.8 GE in arithmetic. However, 13% (236) of the sixth-grade pupils were at or above the national norm.

School achievement control strategy. The configuration of PSCs within this model indicated that its systematic input system was directed toward controlling all factors which influence pupil performance (BAS + IO + SUP). In contrast to the amounts of money spent for PSCs in the previous model, the expenditures for IO and SUP remained about the same (0.8%), whereas the increase for BAS was threefold. This expenditure pattern seemed to imply that although there existed a major investment for supportive materials and personnel, the focus of the additions was toward improving the teacher's ability to teach the basic skills. To assist in the management of basic skill instruction, a larger proportion of the schools in the model received instructional aides.

Model 4

Reading. In Figure 21 (p. 71), the data indicate that the average third-grade pupil completed the year with a reading score of 2.9 GE, which is 0.9 GE below the national norm. This deficiency increased to 2.1 GE at grade 6. The proportion of pupils in Q_3-Q_4 decreased from 20% at grade 3 to 12% at grade 6. At Q_2 the percentage of pupils decreased consistently across the grades to a level of 8% at grade 6. The proportions in Q_1 increased from a low of 59% to a high of 80% in grade 6. The number and kinds of PSCs ranged from a minimum of four at grade 3 to a maximum of eight at grade 6. The average amounts of monies spent for the PSCs were: $20,600 for BAS, $12,500 for IO, and $17,100 for SUP. The pupil output summary showed (a) that the average sixth-grade pupil was



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

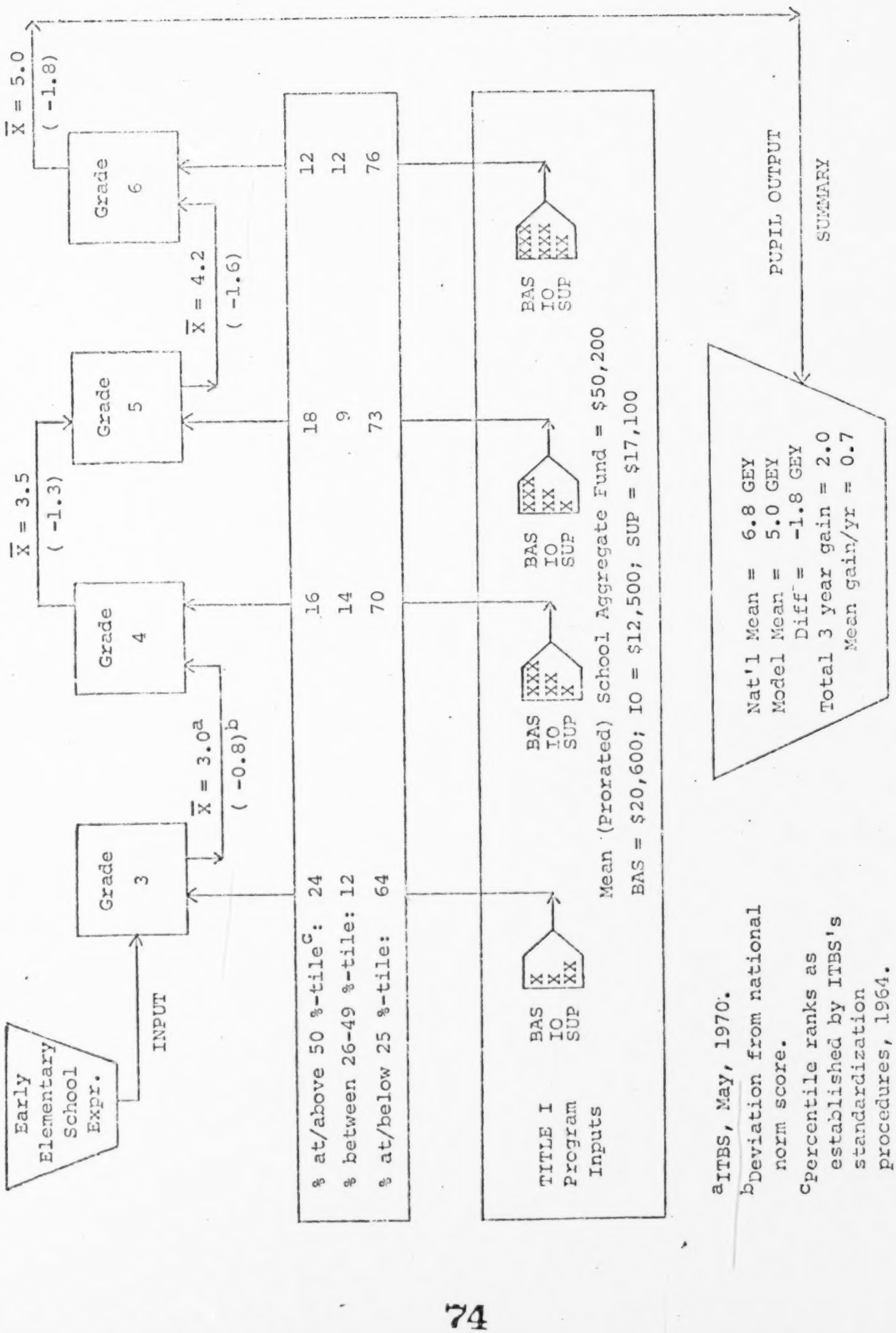
[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

Figure 21. Model 4's program inputs for improved pupil outputs in reading achievement.

behind by 2.1 GE in reading and (b) that the combined investments produced a total gain of 1.8 GEY over the three grades or 0.6 GE per year. However, 12% (167) of the sixth-grade pupils were at or above the national norm.

Arithmetic. In Figure 22, the data indicate that the average third-grade pupil completed the grade with an arithmetic score of 3.0 GE, which is 0.8 GE below the national norm. This deficiency increased to 2.8 GE at grade 6. The proportion of pupils in Q_3-Q_4 dropped by 12% across the grades. The proportion of pupils in Q_2 fluctuated by ± 3%, ending up at its average value of 12%. At Q_1 the proportions increase systematically to a level of 76% at grade 6. The PSCs available to the grades produced a mean gain of 3.0 GEY across the grades or a gain of 0.7 GE per year. The average sixth-grade pupil was behind by 1.8 GE in arithmetic. However, 12% (153) of the sixth-grade pupils were at or above the national norm.

School achievement control strategy. The configuration of PSCs within this model indicated that its systematic input system was directed toward controlling all factors which influence pupil performance (BAS + IO + SUP). In contrast to the amounts of money spent for PSCs in the previous model, the changes in expenditures formed a geometric progression: 13% for SUP, 30% for IO, and 48% for BAS. When SUP was considered as the basal increase (SUP = 1), the ratios of increase became SUP = 1, IO = 2.3, BAS = 4.6 respectfully. When the amounts of money spent for PSCs were compared across Models 2 through 4, it was noted that the increased spendings for IO and SUP projects formed a pattern--the increases from Model 3 to 4 were twice those from 2 to 3. For BAS projects, the absolute amount allocated to Model 2 increased by threefold in Model 3 and



[a]ITBS, May, 1970.

[b]Deviation from national norm score.

[c]Percentile ranks as established by ITBS's standardization procedures, 1964.

Figure 22. Model 4's program inputs for improved pupil outputs in arithmetic performance.

by twofold in Model 4.

The decremental changes in expenditure patterns suggested that this model represented the maximization of instructional inputs for the improvement of the basic skills, as witnessed by the high level of spending for BAS projects ($20,600). The high level of BAS expenditure permitted the establishment of five Reading Skill Centers where the reading disabilities of the children are diagnosed and individual, corrective programs are prescribed. The collective expenditures for BAS and SUP also afforded the availability of individualized instruction in reading and arithmetic in the classroom.

DISCUSSION

As stated earlier (p. 13), the major purpose for developing the impact component analysis technique was to provide operational management with information about the feasibility and viability of the program (instructional) configurations their implementation decisions had produced. The need for such information was demonstrated in the hierarchial decision-making and reporting structure shown in Figure 1. It was noted that operational management are those persons who are responsible for translating strategic plans into operational units (projects) that assist instructional management (i.e., teachers, principals) in improving the achievement of the pupils in the target population.

The technique was designed to provide four kinds of information. The four specific output objectives were:

1. To identify and describe the implementation patterns within the 63 elementary schools;

2. To ascertain whether the impact components of the emerging implementation pattern are consistent with the needs-assessment of the pupil populations they were designed to serve;

3. To produce service-cost information which relates implementation inputs to anticipated and/or attained pupil and school outputs; and

4. To provide operational management with a number of alternative procedures for narrowing the discrepancy between desired pupil outputs and systematic program inputs.

A brief response to each of the four output objectives follows.

Implementation Models: Patterns

The results of the evaluation of the investment of Title I projects in 63 elementary schools indicated that there exists within the school district four Title I Implementation Models. These models seemed to have evolved (a) from the decisions of operational management in its responsibility for translating the policies of strategic management into implementation practices and (b) from the assessed needs of the pupil populations being served by the 63 elementary schools. The configuration of instructional inputs ranged from the consideration of basic experiences to improve one's self-image (affective variables) to the articulation of specific corrective feedback loops to meet the individual needs of the children [during the learning of reading and arithmetic skills (cognitive variables.)] The prescriptive treatment sets (pupil service components) assigned to the implementation models were those which could, according to Bloom's partition of school achievement variance, systematically improve pupil performance.

Implementation Models: Needs-Assessment Quality

The results of impact component analysis indicated that the planning strategies and allocation procedures used by operational management were successful in that:

. Each of the four implementation models was designed to meet the needs of a specific subset of pupils within the aggregate target population;

. The number and kinds of projects made available to the respective schools provided pupil service components which would systematically control achievement variance;

. The realized funds available to the schools (school aggregate funds) were allocated in a manner such that the greater proportions of monies were available to those schools having the greatest needs;

. The realized per capita expenditures for pupils and teachers within the designated models increased as a function of the pupil needs in the corresponding population, which represents an effort to recognize and implement the concentration principle;

. As the number of pupils from low income families increased, the level of per capita and total school expenditures increased proportionally, which represents an effort to meet the criteria for program comparability;

. A technique for establishing program accountability measures and identifying effective program delivery systems for disadvantaged children was developed.

Implementation Models: Service-Cost Information

Preliminary results suggested that (a) although the allocation patterns derived through the placement of Title I projects were consistent

with the needs of the pupils and (b) although the reliability of the expenditures for the PSC configurations were corroborated, it appeared that the current proportions of monies spent for the PSCs within the models were not producing the expected levels of pupil performance. If one had proposed the expenditures to place Title I pupils at their appropriate grade-level performance, then the expenditure objective was partially attained in Model 1--an attainment range of 33-50%. If one had proposed the expenditures to minimize the proportion of Title I pupils who place in the first quartile (Q_1), then only Model 1 ($\bar{X}$=44%) partially achieved the objective, whereas the other models did not (viz., $\geq$ 66% of their pupils placed in Q_1). If one had proposed the expenditures to produce a uniform growth pattern of one performance-achievement year between the grades within a school, then the expenditure objective was partially fulfilled in Model 1 ($\bar{X}$=0.8 GE/year); the value of the other models was approximately 0.65 GE per year.

The distribution of the average PSC expenditures within the implementation models are shown in Table 14.

TABLE 14

Distribution of Pupil Service Component (PSC) Expenditures

PSC Category	Implementation Model			
	Educational-Cultural Enrichment Experiences (M-1)	General Instructional and Supervisory Support System (M-2)	Intensive Instructional and Supervisory Support System (M-3)	Remediation Programs (M-4)
BAS	---	13.5	36.0	41.0
10	41.0[a]	31.7	24.9	24.9
SUP	59.0	54.8	39.1	34.1
Total	100.0	100.0	100.0	100.0

[a]Percent of model's total.

Implementation Models: Alternative Input Procedures

Analyses of the previous findings indicate that although operational management had organized, through its project allocation procedures, four programmatic models for delivering appropriate (need-assessed) Title I resources to disadvantaged elementary school children, the current within-model expenditures for PSCs are not producing the desired levels of pupil performance. It would appear from these data and findings that at least six (6) procedural alternatives could be instituted to reduce the discrepancy between the programmatic inputs and desired pupil outputs.

Alternative #1. Redistribute the levels of PSC expenditures within each model.

This procedure assumes that the current implementation models have programmatic (thematic) inputs which are consistent with the needs of each pupil population, but that the level of funds allocated within the models for the respective PSCs are disproportionate to the required services. For example, past evaluations of the Reading Skill Center (RSC) project* have demonstrated that RSC improve the reading ability of Title I pupils; however, 2 of the 28 schools in M-3 have RSC, and 4 of 15 in M-4 (see Table 9, p. 36). The reallocation procedure in this case would be to reduce the level of expenditures for IO and SUP project inputs and to increase the expenditure for BAS projects by adding more RSCs.

This procedure also implies that although the appropriate combination of programmatic inputs have been assembled, no logical method for ascertaining the functional relationships between the permutations of within-model expenditure patterns and desired pupil outputs was available because of the absence of impact component data.

*Improvement of Reading Skills (IRS)

Alternative #2. Retain PSC configurations, but increase, by a constant factor, the absolute quantity of monies within and across each implementation model.

This procedure is realized by an increase in the total allocation of Title I funds to the School District by a corrective ratio that is equivalent to the total derived from the summations across the implementation models.

Alternative #3. Retain present school aggregate fund (SAF) levels, but permit the staff, parents, and community of the schools to choose from the list of 16 projects a commensurate project configuration they feel will assist them in attaining their needs and/or goals.

This procedure is predicated upon the current concerns for decentralization and community involvement in Federal Programs. Given that the aforementioned persons and institutions have the capability to diagnose, formulate, and initiate instructional programs that meet their collective needs and/or goals, this comprehensive group selects from the "shopping list" of available Title I project components that number of units which is equivalent to its school's aggregate fund (SAF). Basic information about each Title I project's objectives, materials, methodology, and outcomes would be available to the purchasers of Title I program services.

Alternative #4. Modify or replace Title I project components.

This procedure assumes that a specific Title I project component is not meeting its individual objectives and should, therefore, be modified or replaced by another variation/component.

Alternative #5. Reconstruct the implementation models.

This procedure assumes that the current implementation models

are not valid and/or not consistent with the needs of the target population. Therefore, a massive redistribution of the project components is made among the schools. Subsequently, an impact component analysis is performed to ascertain whether the newly constructed implementation patterns were more productive than the former.

Alternative #6. Modify or change strategic and operational goals and objectives.

This procedure is essentially a "back to the drawing board" decision. The procedure entails the total reconstruction of the policies and thrusts of both management levels. The final outcome of this deliberation is envisioned as a new stance or position relative to the allocation, acceptance, or uses of Title I funds within the school district.

CONCLUSIONS

The findings of this study indicate that the methods, procedures, and techniques used to measure or assess the impact of ESEA, Title I program funds on urban elementary schools and their pupils need to be reconsidered. One major assumption upon which current evaluation methods and procedures are based is that the school populations being served by Title I funds are homogeneous with respect to their (a) ethnic composition, (b) individual and collective needs, and (c) achievement characteristics. Another assumption, which tends to be inherent in or an outgrowth of the former, is that the best measure for ascertaining an effective level of pupil service delivery is a per capita (pupil) cost index.

Three salient factors arise from this study which indicate (a) that the previous assumptions are incorrect, (b) that rational patterns

of Title I program component inputs exist within urban elementary schools, and (c) that new procedures and indices must be established if one is expected to improve the reported discrepancy between Title I program inputs and their subsequent pupil outputs.

First, the schools in the target population being served by Title I funds are not homogeneous with respect to their ethnic composition, needs, and achievement characteristics. All indications are that when the conglomerate of schools and their pupils are surveyed/assessed on a given achievement or social variable collectively, the computed mean or median obtained from these data show the traditional performance patterns of Title I schools (see Figure 6), and not the dynamic within-and between-school differences. This is especially true if the schools within the target population have a variety of unique program inputs sets, as was shown in this study by operational management's allocation of Title I program funds according to a needs-assessment criterion.

However, until the impact component analysis technique was developed and used, the reliability of these seemingly intuitive judgments could not be ascertained. As the results show, the needs-assessment criterion procedures of operational management produced four unique implementation models. Each model, described on pages 39-42, has demographic, expenditure levels, needs-assessment characteristics, and program component inputs that are significantly different. Even the program component inputs--pupil service components (PSC)--represented program treatment conditions that were analogous to the systematic variables Bloom described as being capable of controlling up to 90% of school achievement variance (see Table 1).

sequent pupil outputs. As is evidenced by the six procedural alternatives proposed to improve the pupil outputs of the implementation models (see pp. 78-80), operational management needs to have an opportunity to modify and/or restructure the implementation practices they have instituted from past information. Since they have had the opportunity to reallocate and modify individual projects within a school setting to produce projects that yield successful outcomes, so must they be able to reallocate the PSCs within the defined implementation model to discover which permutation of PSC produces the treatment control conditions discovered by Bloom.

Moreover, when one considers the school to be the unit of cost accountability, it appears as if one could discover that configuration and level of pupil services which lead to the maximization of a school's potential to improve the achievement of disadvantaged pupils. This assumption appears to be tenable in that, not only were school expenditure densities (PDC) a significant contributor to Factor II, but they were also evidenced in Factor IV (Direct Pupil Service Components), Factor III (School Achievement Measurement), and Factor VI, (School Investment Outputs). Collectively, these factors seem to imply that Title I schools should become the accountability units of financial/cost inputs and pupil outputs.

To ascertain the effectiveness of the modifications mentioned above, new methods must be used to determine whether these revised procedures produce more successful outcomes. Instead of using a contemporary technique for evaluating the impact of the implementation models, the evaluator must reexamine each model to ascertain which dependent variables are being affected by the thrusts of the implementation models. As in the

case of M-1 mentioned in this study, the evaluation design would be concerned with determining whether investments in educational/cultural experiences produce an increase motivation for learning--operationally defined as an improved attitude toward school and the learning process. A statistic of choice might be (a) the analysis of covariance or (b) the use of the Spearman Rho technique to determine whether changes in attitudes were significantly related to improved performance in reading and arithmetic. In addition, a general content embedded test, consisting of face-valid items, could be developed whereon a specified criterion score would represent a measurable increase in one's knowledge of his and other's culture (viz., World Affairs Club).

In summary, the findings of this study seem to indicate that

(1) systematic patterns of pupil service needs exist within Title I target populations,

(2) LEA's operational management employ a needs-assessment criterion in the allocation of Title I program funds,

(3) Title I program implementation models exist within a LEA's district such that the between model allocations are a function of school and pupil needs,

(4) investment of Title I funds are producing a positive differential effect on school and pupil achievement,

(5) pupil outputs from Title I investments can be maximized,

(6) a method for ascertaining the relationship between the impact of program implementation strategies and pupil outputs has been introduced, and

(7) a new method for assessing the impact of Title I program

funds on urban elementary schools has been developed for improving the procedure and/or processes for reallocating the program funds to realize higher levels of pupil performance.

Appendix A

Intercorrelation Matrix of 24 Variables Associated with Programmatic Input, Demographic Characteristics, and School Output for ESEA, Title I Elementary Schools

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1.	SE	-																							
2.	ADA	87	-																						
3.	PPC-1	68	51	-																					
4.	PPC-2	-01	-02	25	-																				
5.	PPC-3	84	72	62	-27	-																			
6.	TS	88	82	67	01	83	-																		
7.	AGD-R	14	16	-05	-09	-07	08	-																	
8.	AGD-A	-04	-05	02	-13	-13	-05	77	-																
9.	PDC	23	15	46	05	34	24	-37	-21	-															
10.	PSC-1	26	10	53	12	40	26	-36	-09	66	-														
11.	PSC-2	18	15	30	-23	28	17	-30	-22	82	34	-													
12.	PSC-3	25	15	42	10	32	24	-28	-15	74	55	38	-												
13.	SAF-1	39	36	33	-36	42	36	-21	-15	11	58	-03	02	-											
14.	SAF-2	-01	-03	17	-09	03	-02	-16	-07	49	19	57	31	-33	-										
15.	SAF-3	24	11	39	02	37	28	00	06	40	45	23	44	27	-24	-									
16.	SAF-4	27	11	48	03	42	26	-37	-18	78	94	55	62	49	42	48	-								
17.	PPE	-46	-51	-06	05	-26	-46	-36	-01	47	50	28	39	-09	34	15	54	-							
18.	PTE	-41	-45	-02	07	-22	-46	-42	-09	56	54	38	48	-03	37	17	59	96	-						
19.	PPIS	-61	-58	-41	-13	-42	-46	-06	04	-13	-08	-09	-20	-25	03	-05	-06	38	28	-					
20.	SPPE	-65	-66	-33	-08	-43	-55	-20	02	12	16	06	03	-23	18	03	20	73	64	91	-				
21.	SAG-1	-06	-12	-12	08	-07	-04	09	00	-15	-02	-16	-10	03	-09	11	-02	06	00	19	16	-			
22.	SAG-2	-14	-19	-12	17	-16	-06	-06	03	08	17	05	08	-07	02	08	16	33	24	25	34	57	-		
23.	SAG-3	10	10	07	-01	15	18	49	46	-11	12	-08	-15	15	-07	23	05	-12	-15	13	04	31	14	-	
24.	SAG-4	-16	-15	-17	-17	-05	-10	40	50	-08	04	-13	-01	-02	-16	23	-06	18	10	23	25	32	40	52	-

98

References

1. Tempo Center for Advanced Studies. Report 71TMP-23: Evaluation of Title I ESEA Compensatory Education. Santa Barbara, Calif.: TEMPO, General Electric Company, 1971.

2. National Advisory Council on the Education of Disadvantaged Children. 1971 Annual Report for the President and Congress on Title I, ESEA. Washington, D.C.: The Council, 1971.

3. Bloom, B. S. Individual differences in school achievement: a vanishing point? Department and Graduate School of Education, University of Chicago, (Winter), 1971.

4. Ausubel, D. P. Viewpoint from relative disciplines: human growth and development. In J. P. DeCecco (Ed.), Human learning in the schools. New York: Holt, 1963. Pp. 67-80.

5. Jensen, A. R. Understanding readiness: an occasional paper. Urbana, Ill: ERIC Clearinghouse on Early Childhood Education, National Laboratory on Early Childhood, 1969.

6. Harlow, H. F. Learning set and error factor theory. In S. Koch (Ed.), Psychology: a study of science. Vol. 2. New York: McGraw-Hill, 1959. Pp. 492-537.

7. Gagné, R. M. and Paradise, N. E. Abilities and learning sets in knowledge acquisition. In J. P. DeCecco (Ed.), Human learning in the schools. New York: Holt, 1963. Pp. 30-51.

8. Campbell, D. T. Temporal changes in treatment-effect correlations: a quasi-experimental model for institutional records and longitudinal studies. In Proceedings of the 1970 Invitational Conference on Testing Problems. Princeton, N. J.: ETS, 1971. Pp. 93-110.

9. Baker, R. L. Curriculum evaluation. Review of Educational Research, 1969, 39(3), 339-366.

10. Brown, E. K. More effective educational research through the use of process evaluation techniques. Journal of Research and Development in Education, 1970, 3(4), 59-71.

11. Guba, E. G. Significant differences. Educational Researcher, 1969, 20(3), 4-5.

12. Grobman, H. Evaluation activities of curriculum projects. AERA Monograph Series on Curriculum Evaluation. No. 2. Chicago: McNally, 1968.

13. Stanley, J. C. Reactions to the March article on significant differences. Educational Researcher, 1969, 20(5), 8-9.

14. Ob. Cit., Campbell.

15. Lieberman, M. An overview on accountability. Phi Delta Kappan, 1970, 52(4), 194-195.

16. Bowman, M. J. Economics of education. Review of Educational Research, 1969, 39(5), 641-670.

17. Foster, C. W. (Ed.) The first national conference on PPBES in education. Chicago: Research Corporation of the Associate Business Official, 1969.

18. Lopez, F. M. Accountability in education. Phi Delta Kappan, 1970, 52(4), 231-235.

19. Popin, L. Benefit/cost analysis. Philadelphia: Research for Better Schools, Inc., 1969.

20. Chuang, Y. C. and Peper, J. B. The Philadelphia Model for Title I Evaluation. Philadelphia: Office of Research and Evaluation, School District of Philadelphia, 1969.

21. Fox, P. D. A theory of cost-effectiveness for military systems analyses. Journal of the Operations Research Society of America, 1965, 13, 191-201.

22. Hamberg, M. Statistical decision theory and benefit-cost analysis of preferredness of choice among alternative projects. Psychology of Management Theory, 1967, pp. 44-60.

23. Technomics. The feasibility of cost-effectiveness analysis for Title I, Public Law 89-10. Santa Monica, Calif.: Technomics, Inc., 1966.

24. Zabronsky, H. A mathematical theory of cost-effectiveness. Socio-Economics Planning Sciences, 1967, 1, 3-18.

25. Barro, S. M. An approach to developing accountability measures for the public schools. Phi Delta Kappan, 1970, 52(4), 196-205.

26. Green, T. F. The Educational Policy Research Center at Syracuse: Problems and prospects. Journal of Research and Development in Education, 1969, 2, 49-66.

27. Durstine, R. M. An accountability information system. Phi Delta Kappan, 1970, 52(4), 236-239.

28. Title I, ESEA Annual Report. Philadelphia: Office of Research and Evaluation, School District of Philadelphia, 1968-1971.

29. Herrmann, C. C. and Magee, J. F. 'Operations research' for management. In E. C. Bursk and J. F. Chapman (Eds.), New decision-making tools for managers. Cambridge, Mass.: Harvard University Press, 1963. Pp. 1-29.

30. Macleod, R. K. Program budgeting works in nonprofit institutions. Harvard Business Review, 1971, 49(5), 46-56.

31. Block, E. B. Accomplishment/cost: better project control. Harvard Business Review, 1971, 49(3), 110-124.

32. Manual for the preparation of the Consolidated Program Information Report (CPIR). Washington, D. C.: Bureau of Elementary and Secondary Education, U.S. Department of Health, Education, and Welfare, Office of Education, 1970.

33. Ob. Cit., TEMPO.

34. 1970-1971 School Operating Budgets: Cost Per Pupil. Philadelphia: School District of Philadelphia, Office of Finance, 1970.